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Lee et al.

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(54) **ELECTRONIC DEVICE AND FINGERPRINT AUTHENTICATION INTERFACE METHOD THEREOF**

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G06K 9/00 (2006.01)
(Continued)

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CPC ***G06K 9/0002*** (2013.01); ***G06F 3/017*** (2013.01); ***G06F 3/0488*** (2013.01); ***G06F 21/32*** (2013.01); ***G06K 9/00087*** (2013.01)

(58) **Field of Classification Search**
CPC G06F 21/32; G06F 3/0412; G06F 21/31; G06F 21/62; G06F 3/0416;
(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

9,043,900 B1 5/2015 Kim et al.
9,887,949 B2 2/2018 Shepherd et al.
(Continued)

FOREIGN PATENT DOCUMENTS

CN 107688734 A 2/2018
JP 2017-517072 6/2017
(Continued)

OTHER PUBLICATIONS

International Search Report dated Jun. 21, 2019 in counterpart International Patent Application No. PCT/KR2019/002312.
(Continued)

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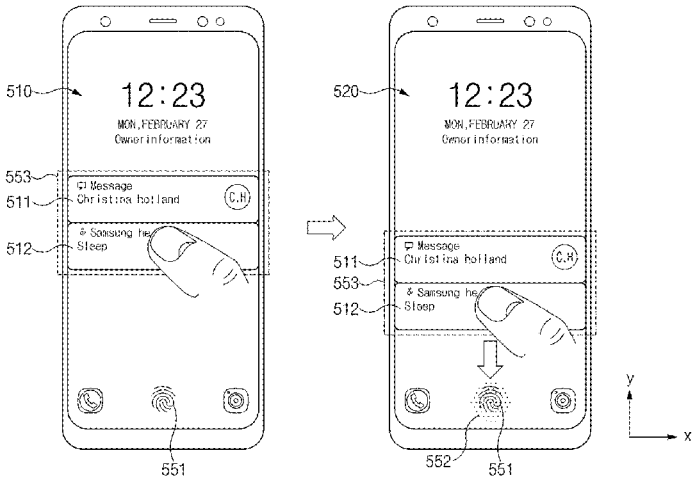
(57) **ABSTRACT**

The disclosed electronic device may include a front plate and a rear plate, a touch screen display exposed through a part of the front plate, a fingerprint sensor disposed to overlap a region of the display when viewed from above the front plate, a processor operatively connected to the display and the fingerprint sensor, and a memory operatively connected to the processor. the memory may store instructions that, when executed by the processor, control the electronic device to display a user interface including a first object at a first location of the display, to obtain a gesture input to drag the first object from the first location to the region, to move the first object to the region depending on the gesture input, and to perform authentication using the fingerprint sensor based on the finger being located on the region.

8 Claims, 19 Drawing Sheets



(51) **Int. Cl.**
G06F 3/0488 (2013.01)
G06F 3/01 (2006.01)
G06F 21/32 (2013.01)

(58) **Field of Classification Search**
CPC G06F 21/6245; G06F 3/038; G06F 3/0487; G06F 9/44521; G06F 3/0488; G06F 3/04842; G06F 3/0486; G06K 9/0002; G06K 9/00087; G06K 9/22
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

9,946,861	B2	4/2018	Yoon et al.	
9,998,589	B2 *	6/2018	Miura	H04M 1/72466
10,262,184	B2	4/2019	Roh et al.	
10,771,422	B2 *	9/2020	Shepherd	G06F 3/0482
2013/0139107	A1 *	5/2013	Jung	G06F 3/0482 715/810
2013/0346882	A1 *	12/2013	Shiplacoff	G06F 3/04842 715/753
2014/0359757	A1	12/2014	Sezan et al.	
2015/0004945	A1 *	1/2015	Steeves	H04L 51/24 455/412.2
2015/0169159	A1 *	6/2015	Yang	H04L 67/26 715/808
2015/0220767	A1 *	8/2015	Yoon	G06K 9/00006 382/124
2015/0312765	A1 *	10/2015	Nade	H04M 1/67 455/411
2015/0350147	A1	12/2015	Shepherd et al.	
2015/0363632	A1 *	12/2015	Ahn	G06F 3/04166 382/124
2015/0371073	A1	12/2015	Cho et al.	
2016/0042166	A1 *	2/2016	Kang	G06F 21/32 726/7
2016/0299556	A1 *	10/2016	Jueng	G06F 3/0487
2016/0371691	A1 *	12/2016	Kang	G06Q 20/352
2017/0046024	A1 *	2/2017	Dascola	G06F 3/0485
2017/0109011	A1 *	4/2017	Jiang	G10L 15/22
2017/0109727	A1 *	4/2017	Han	G06Q 20/40145
2017/0185991	A1 *	6/2017	Park	H04W 4/023
2017/0316250	A1	11/2017	Roh et al.	
2018/0063309	A1 *	3/2018	Mizumoto	H04M 1/67
2018/0131657	A1 *	5/2018	Shepherd	G06F 3/0488
2018/0173923	A1 *	6/2018	Lee	G06K 9/0002
2018/0284892	A1 *	10/2018	Kwon	G06F 3/016
2018/0365477	A1	12/2018	Seol et al.	
2019/0266374	A1 *	8/2019	Lee	G06F 3/167

FOREIGN PATENT DOCUMENTS

KR	10-2011-0005937	1/2011
KR	10-2015-0092480	8/2015
KR	10-2015-0092964	8/2015
KR	10-2017-0089661	8/2017
KR	10-2017-0122386	11/2017
WO	2017/073811	5/2017

OTHER PUBLICATIONS

Extended European Search Report dated Jan. 25, 2021 for EP Application No. 19759915.2.

* cited by examiner

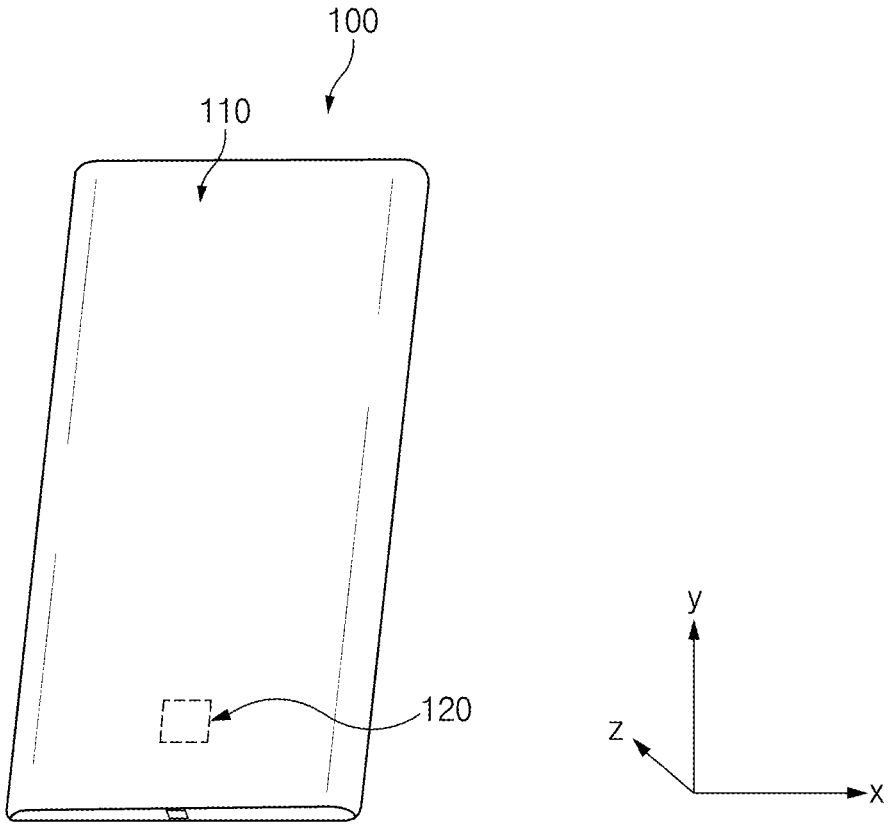


FIG.1

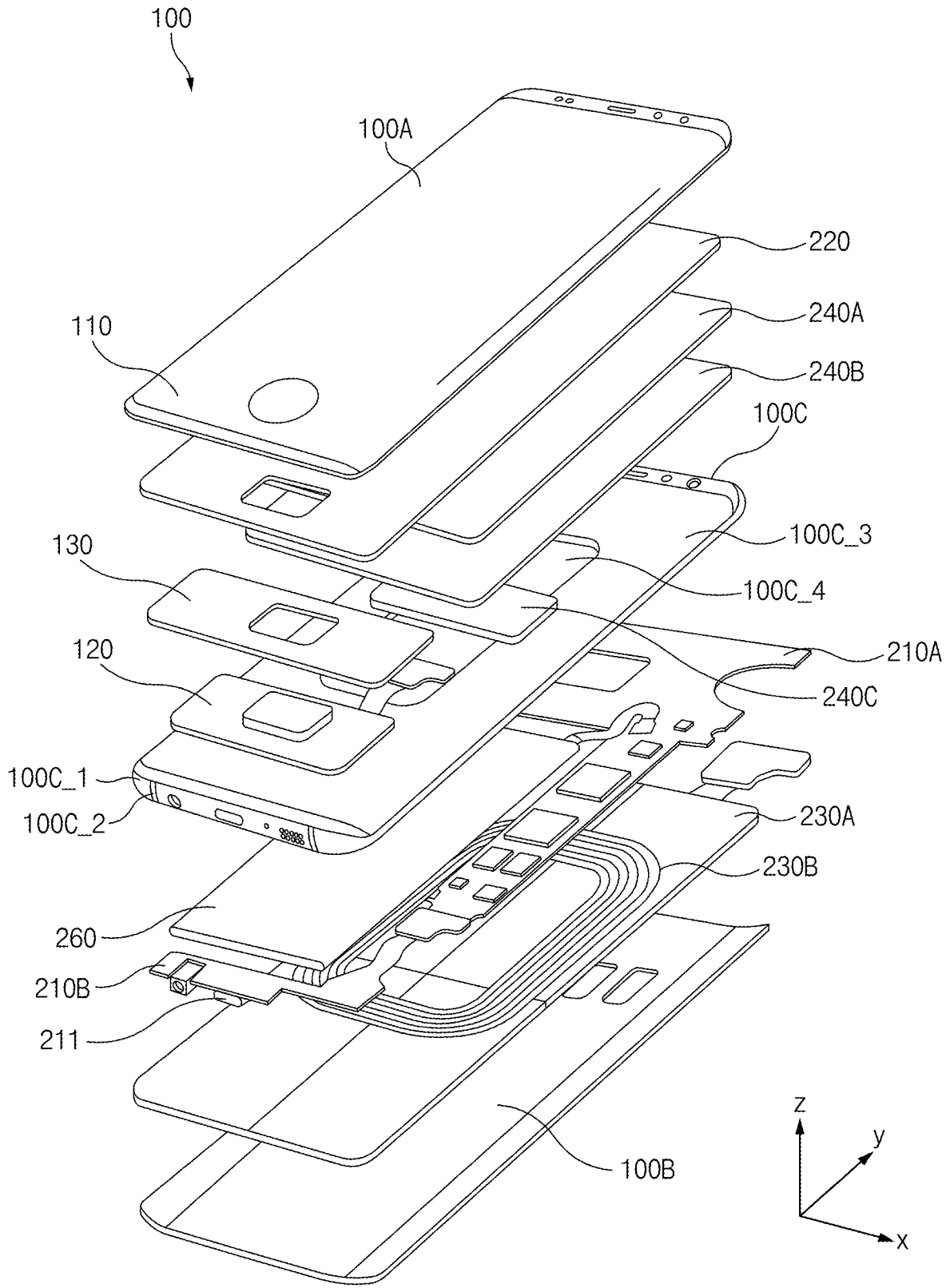

100
100A
220
240A
110
240B
100C
100C_3
130
100C_4
210A
120
240C
100C_1
100C_2
230A
230B
260
210B
211
100B
z
y
x

FIG.2

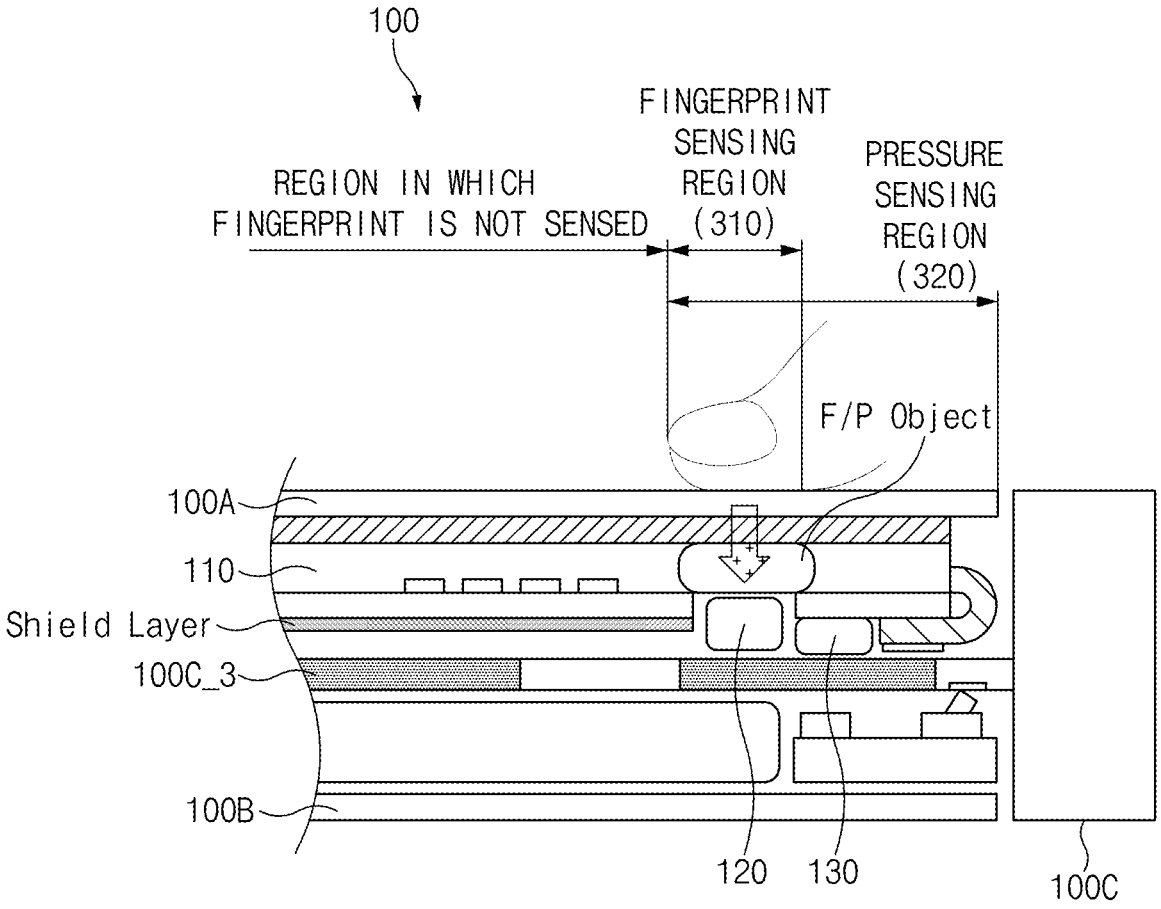

100
FINGERPRINT SENSING REGION (310)
PRESSURE SENSING REGION (320)
REGION IN WHICH FINGERPRINT IS NOT SENSED
F/P Object
100A
110
Shield Layer
100C_3
100B
120
130
100C

FIG.3

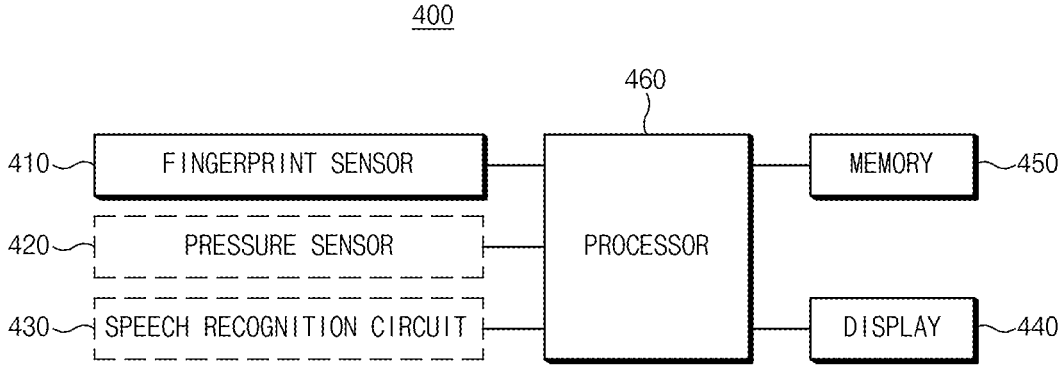

400
460
410
FINGERPRINT SENSOR
420
PRESSURE SENSOR
430
SPEECH RECOGNITION CIRCUIT
PROCESSOR
MEMORY
450
DISPLAY
440

FIG.4

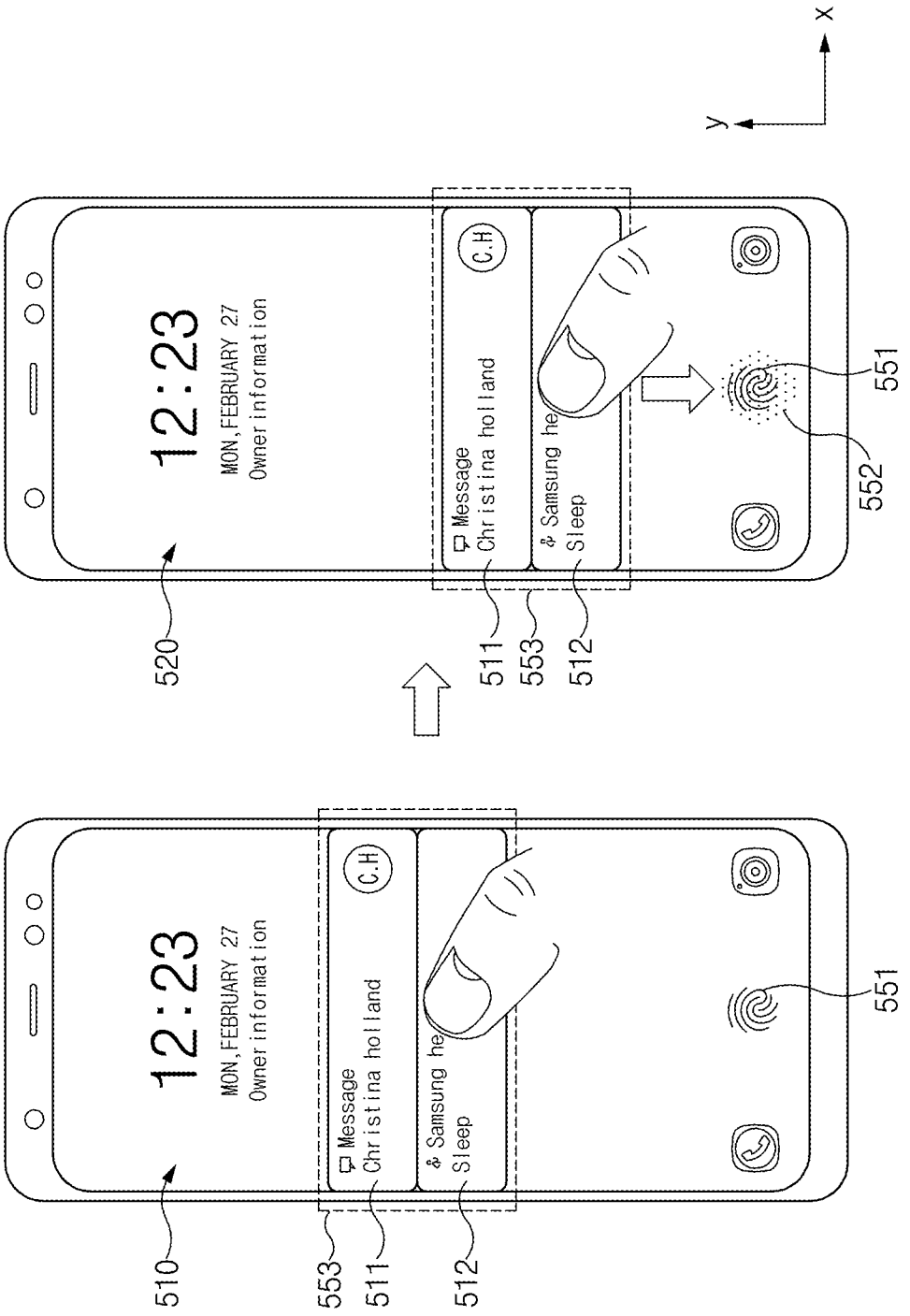

x
y
12:23
MON, FEBRUARY 27
Owner information
Message
Christina holland
C.H
Samsung he
Sleep
510
511
512
520
551
552
553

FIG.5

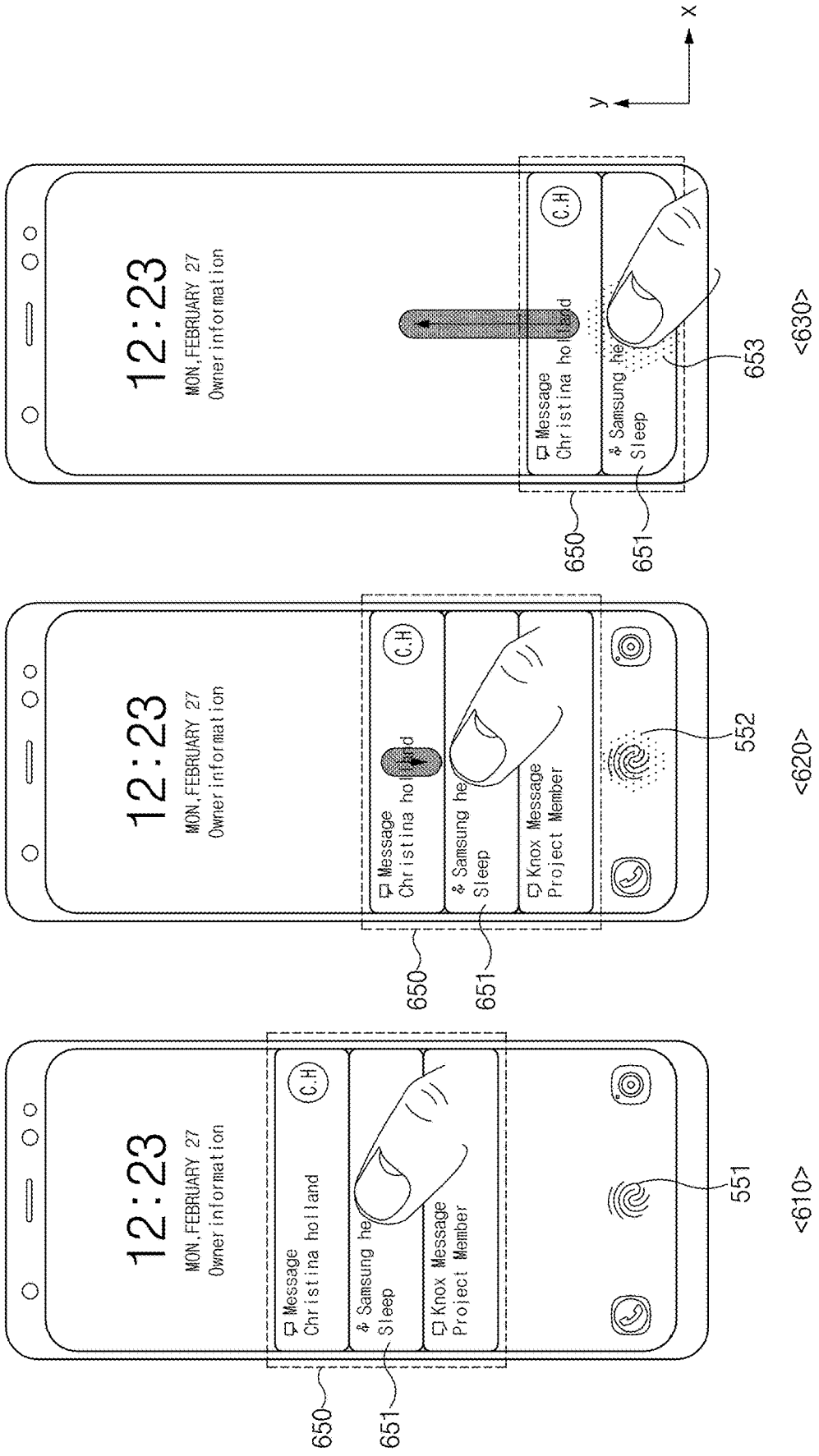

x
y
12:23
MON, FEBRUARY 27
Owner information
Message
Christina holland
Samsung he
Sleep
Knox Message
Project Member
C.H
650
651
653
552
551
<610>
<620>
<630>

FIG. 6

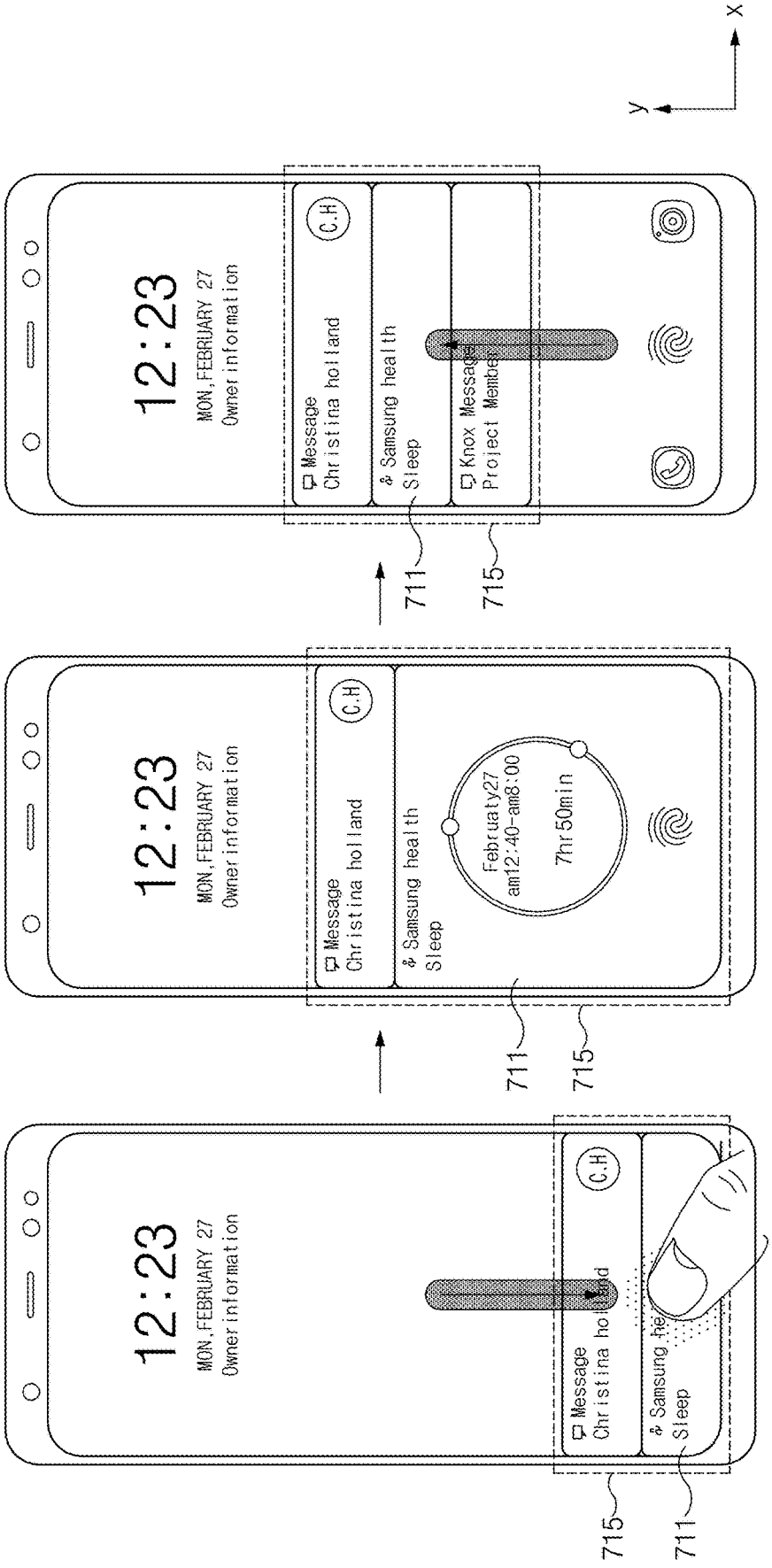

x
y
12:23
MON, FEBRUARY 27
Owner information
Message
Christina holland
C.H
Samsung health
Sleep
Knox Message
Project Member
711
715
<730>
12:23
MON, FEBRUARY 27
Owner information
Message
Christina holland
C.H
Samsung health
Sleep
February27
am12:40-am8:00
7hr 50min
711
715
<721>
12:23
MON, FEBRUARY 27
Owner information
Message
Christina holland
C.H
Samsung he
Sleep
715
711
<710>

FIG. 7A

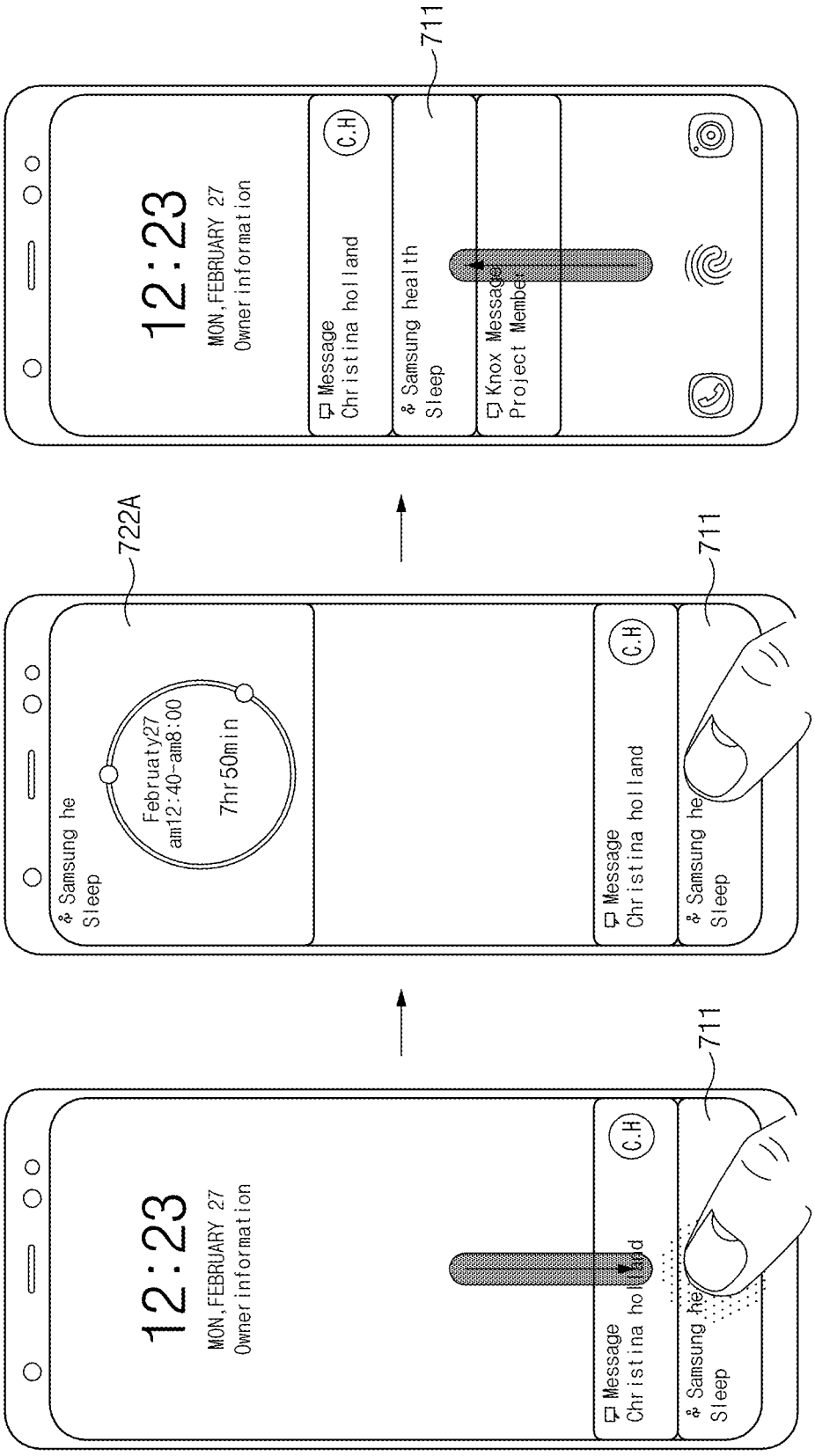

12:23
MON, FEBRUARY 27
Owner information
Message
Christina holland
C.H
Samsung health
Sleep
Knox Message
Project Member
711
<730>
722A
Samsung he
Sleep
Februaty27
am12:40~am8:00
7hr 50min
Message
Christina holland
C.H
Samsung he
Sleep
711
<722>
12:23
MON, FEBRUARY 27
Owner information
Message
Christina holland
C.H
Samsung he
Sleep
711
<710>

FIG. 7B

12:23
MON,FEBRUARY 27
Owner information
Message
Christina holland
C.H
Samsung he
Sleep
Efficeiency
Actual Sleep Time
Motionless
Calories burned
Februaty27
am12:40-am8:00
7hr50min
811
831
TOUCH RELEASE
SUCCESS OF AUTHENTICATION
<810>
<820>
<830>

FIG.8A

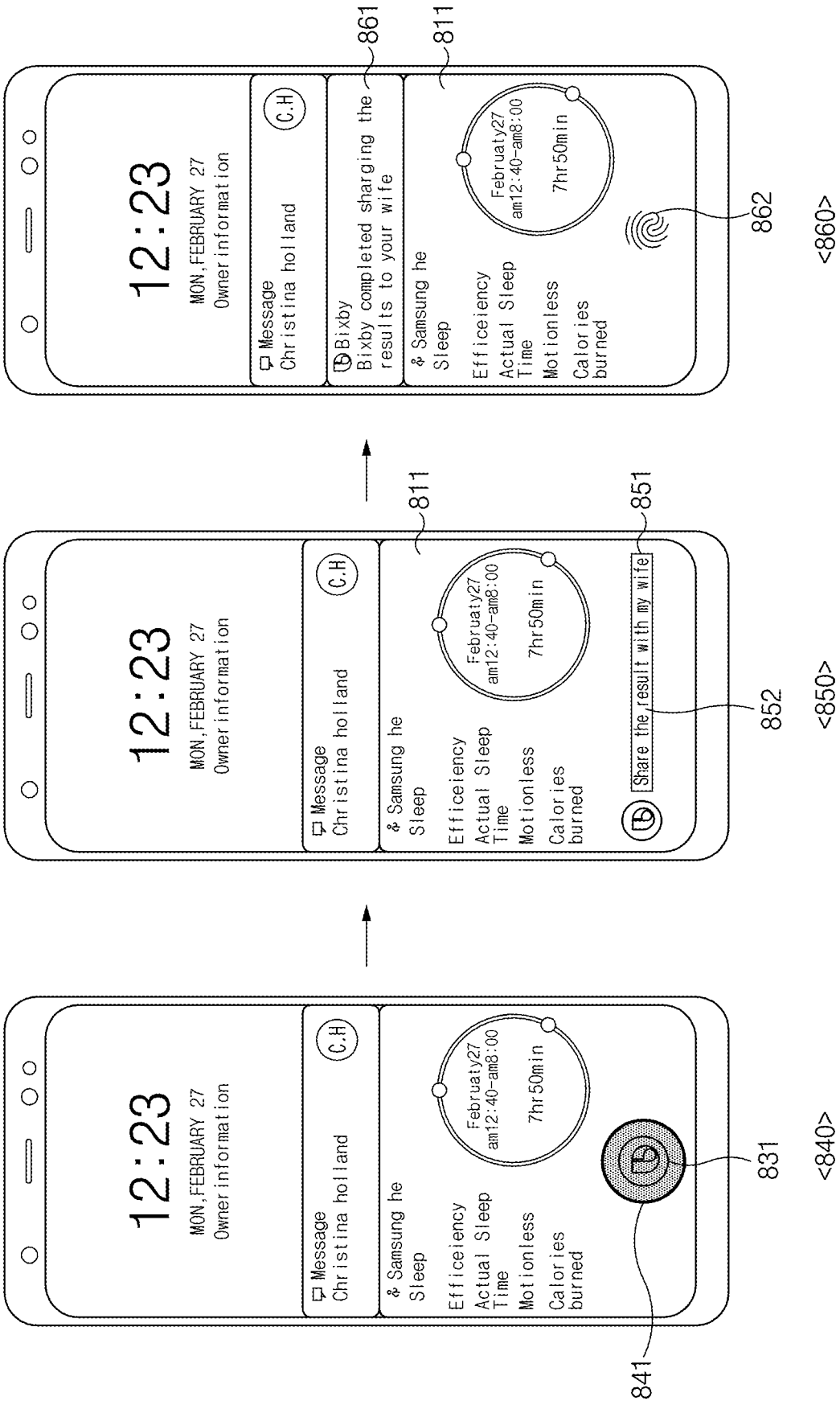

12:23
MON,FEBRUARY 27
Owner information
Message
Christina holland
C.H
Samsung he
Sleep
Efficeiency
Actual Sleep Time
Motionless
Calories burned
Februaty27
am12:40-am8:00
7hr50min
841
831
<840>
Share the result with my wife
851
852
<850>
Bixby
Bixby completed sharging the results to your wife
861
811
862
<860>

FIG.8B

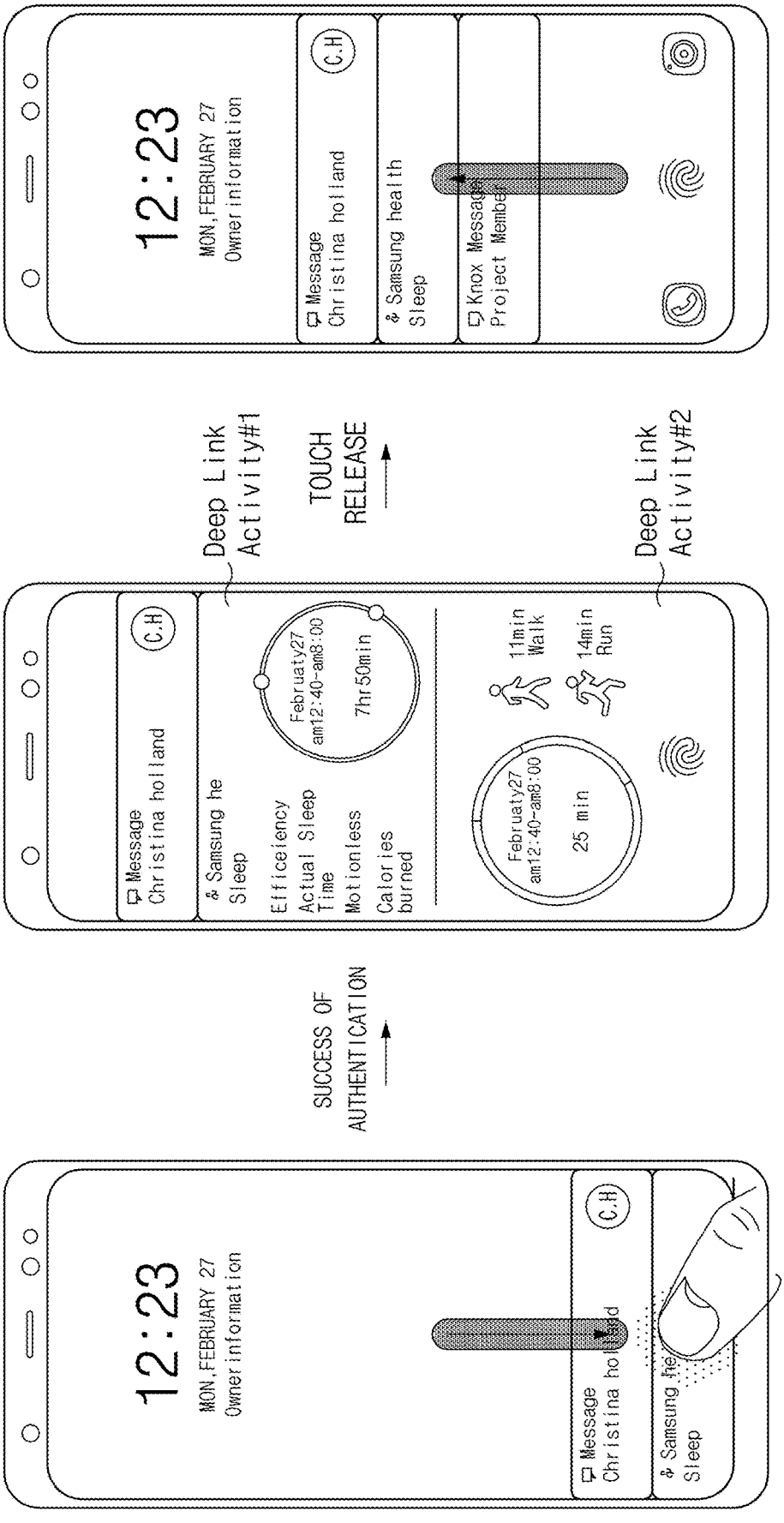

12:23
MON, FEBRUARY 27
Owner information
Message
Christina holland
C.H
Samsung he
Sleep
SUCCESS OF AUTHENTICATION
Deep Link Activity#1
TOUCH RELEASE
Efficeiency
Actual Sleep Time
Motionless
Calories burned
Februaty27
am12:40-am8:00
7hr50min
11min Walk
14min Run
25 min
Deep Link Activity#2
Samsung health
Sleep
Knox Message
Project Member
<910>
<920>
<930>

FIG. 9

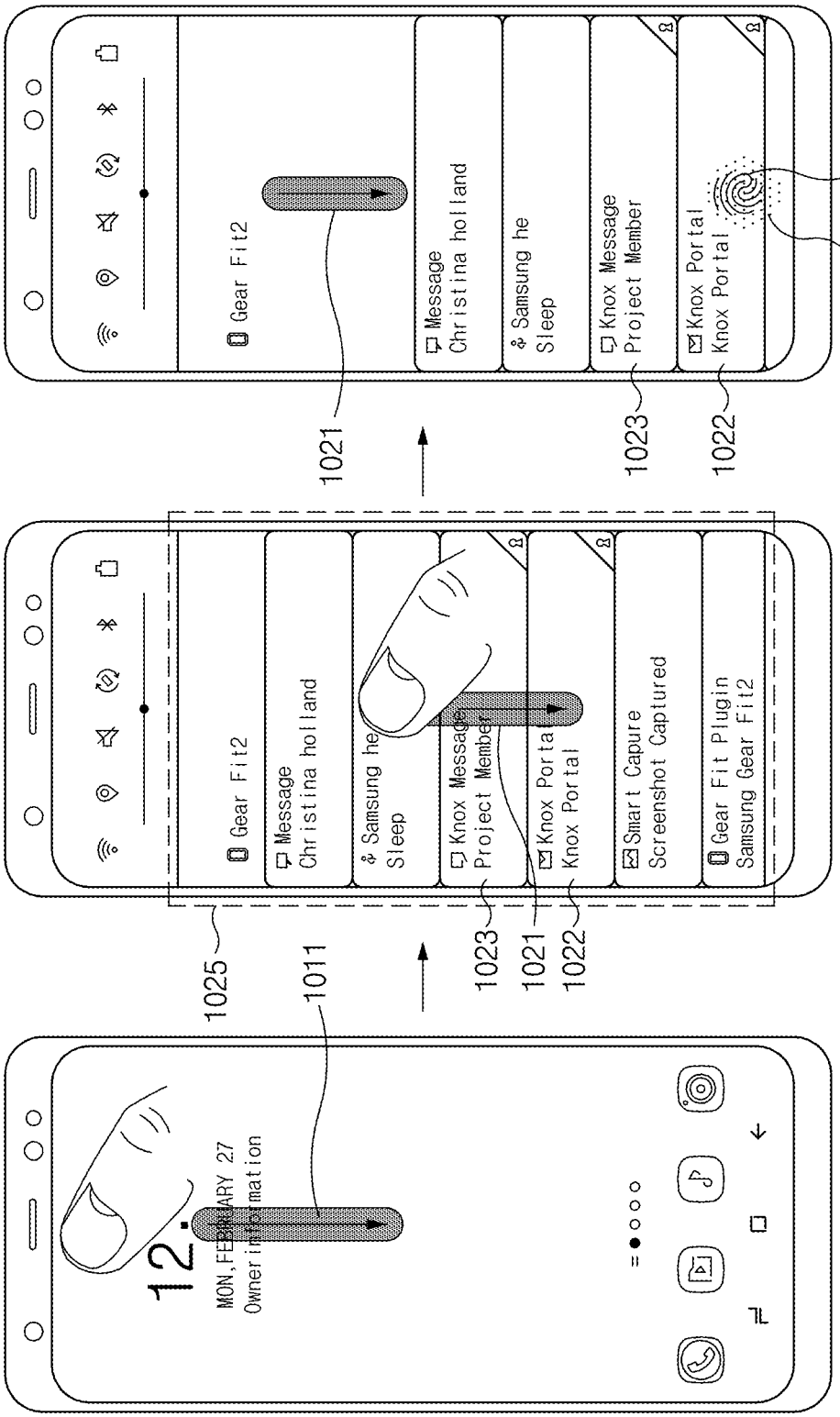

12:
MON, FEBRUARY 27
Owner information
1011
1025
Gear Fit2
Message
Christina holland
Samsung he
Sleep
Knox Message
Project Member
Knox Portal
Knox Portal
Smart Capure
Screenshot Captured
Gear Fit Plugin
Samsung Gear Fit2
1023
1021
1022
Gear Fit2
Message
Christina holland
Samsung he
Sleep
Knox Message
Project Member
Knox Portal
Knox Portal
1021
1023
1022
1031
1032
<1010>
<1020>
<1030>

FIG. 10A

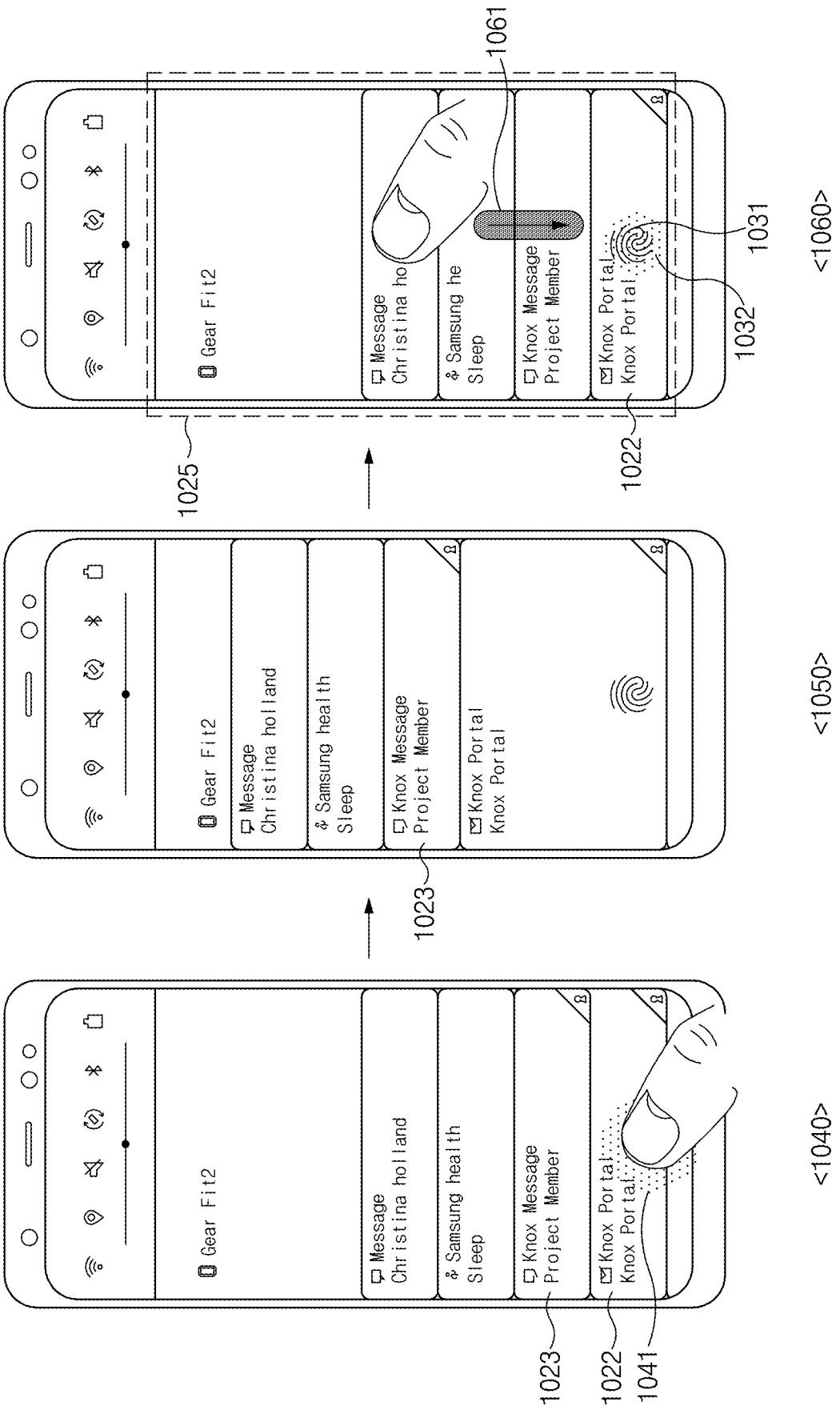

Gear Fit2
Message
Christina holland
Samsung health
Sleep
Knox Message
Project Member
Knox Portal
Knox Portal
1023
1022
1041
1025
1061
1031
1032
<1040>
<1050>
<1060>

FIG. 10B

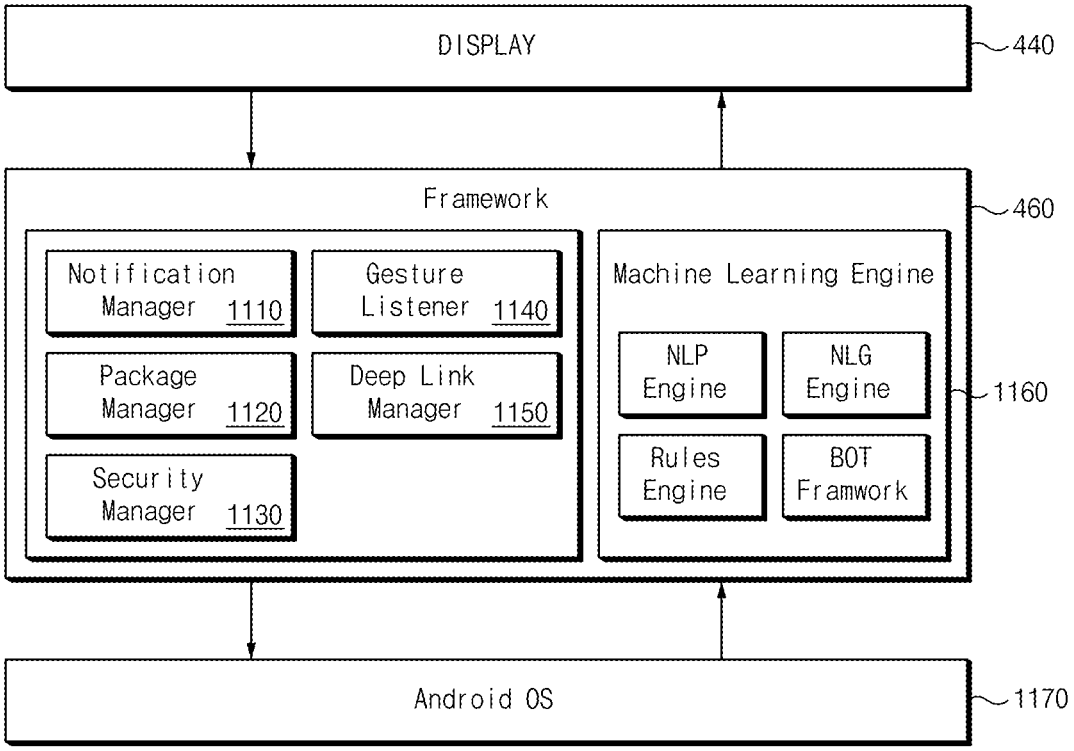

DISPLAY
440
Framework
460
Notification Manager 1110
Gesture Listener 1140
Package Manager 1120
Deep Link Manager 1150
Security Manager 1130
Machine Learning Engine
NLP Engine
NLG Engine
Rules Engine
BOT Framwork
1160
Android OS
1170

FIG.11

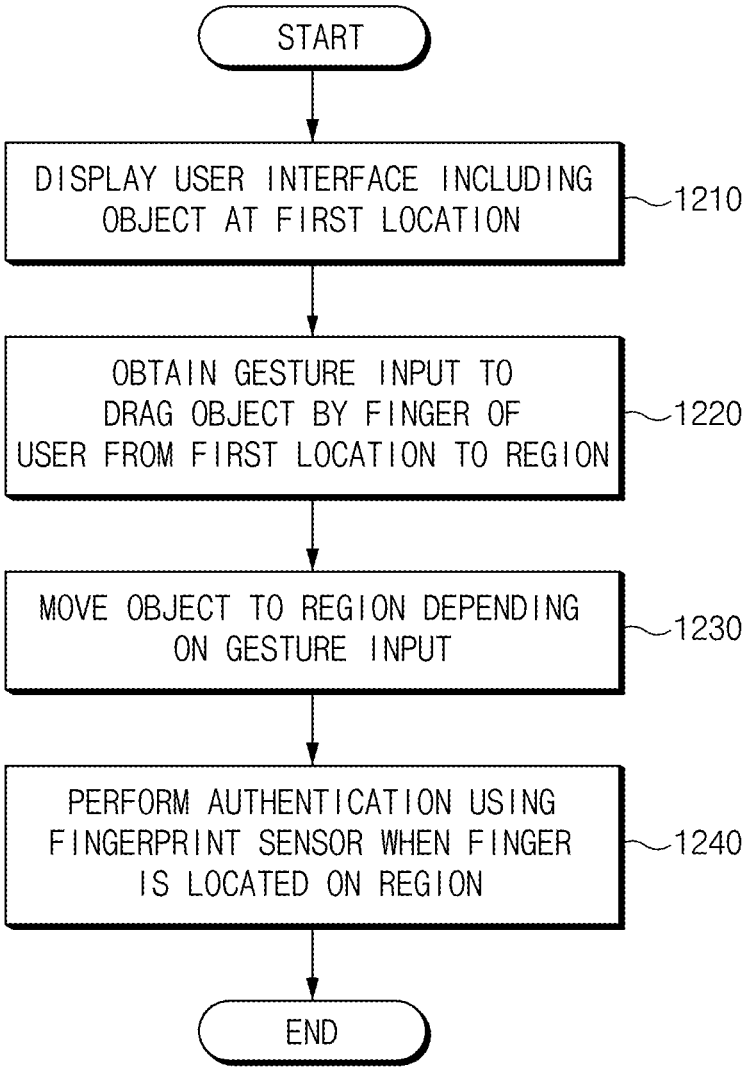

START
DISPLAY USER INTERFACE INCLUDING OBJECT AT FIRST LOCATION
1210
OBTAIN GESTURE INPUT TO DRAG OBJECT BY FINGER OF USER FROM FIRST LOCATION TO REGION
1220
MOVE OBJECT TO REGION DEPENDING ON GESTURE INPUT
1230
PERFORM AUTHENTICATION USING FINGERPRINT SENSOR WHEN FINGER IS LOCATED ON REGION
1240
END

FIG.12

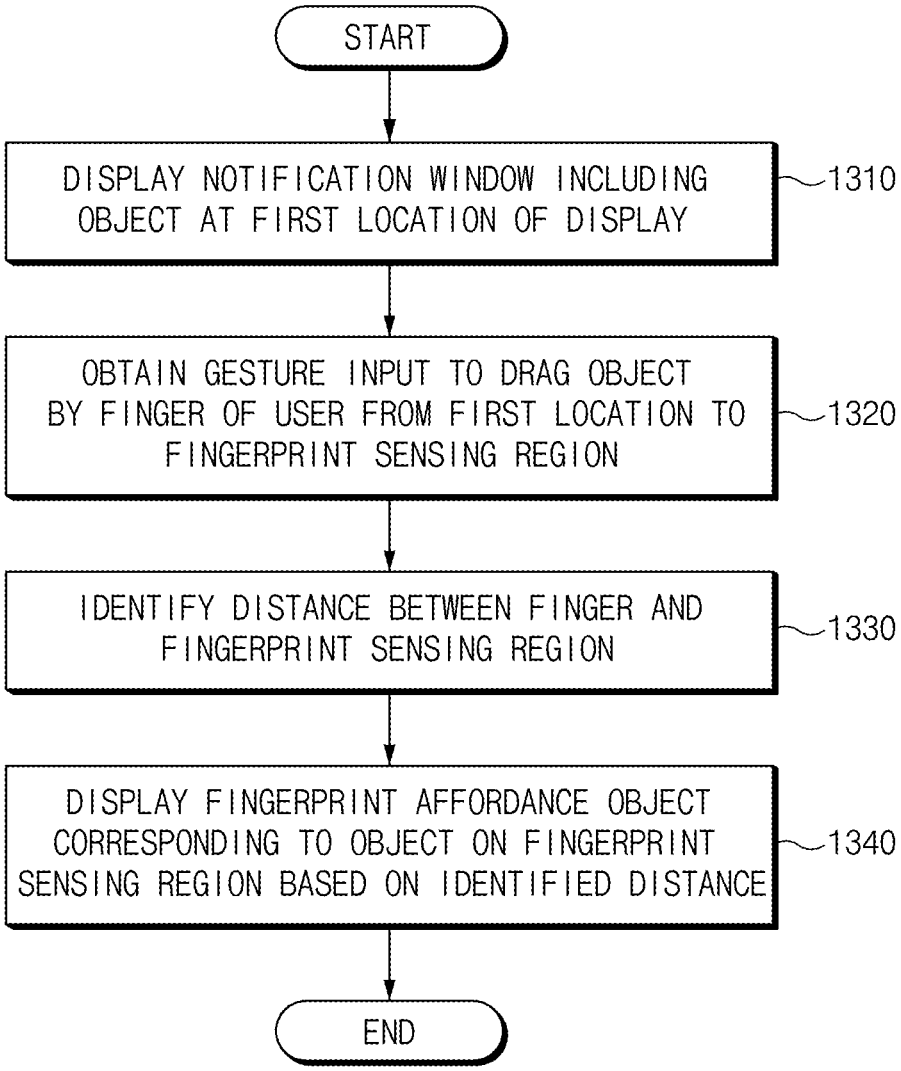

START
DISPLAY NOTIFICATION WINDOW INCLUDING OBJECT AT FIRST LOCATION OF DISPLAY
1310
OBTAIN GESTURE INPUT TO DRAG OBJECT BY FINGER OF USER FROM FIRST LOCATION TO FINGERPRINT SENSING REGION
1320
IDENTIFY DISTANCE BETWEEN FINGER AND FINGERPRINT SENSING REGION
1330
DISPLAY FINGERPRINT AFFORDANCE OBJECT CORRESPONDING TO OBJECT ON FINGERPRINT SENSING REGION BASED ON IDENTIFIED DISTANCE
1340
END

FIG.13

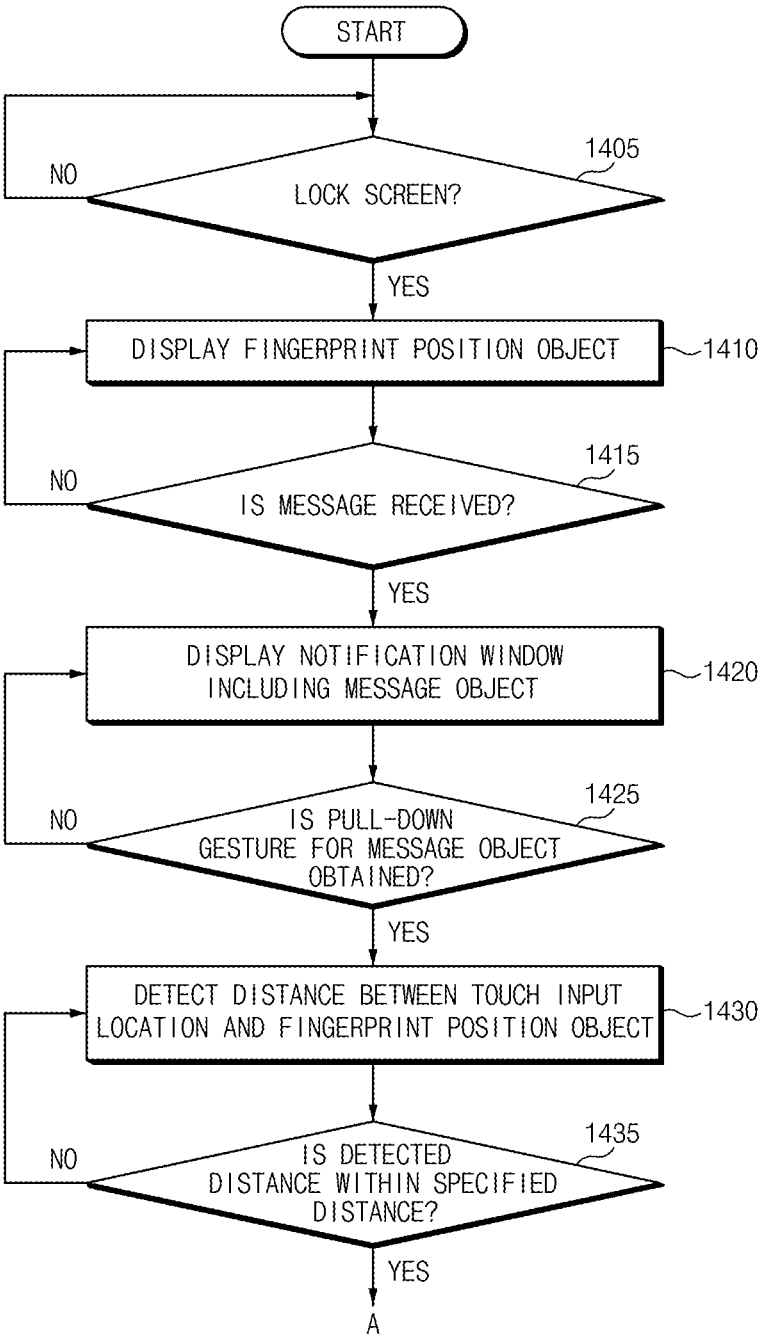

START
1405
NO
LOCK SCREEN?
YES
DISPLAY FINGERPRINT POSITION OBJECT
1410
1415
NO
IS MESSAGE RECEIVED?
YES
DISPLAY NOTIFICATION WINDOW INCLUDING MESSAGE OBJECT
1420
1425
NO
IS PULL-DOWN GESTURE FOR MESSAGE OBJECT OBTAINED?
YES
DETECT DISTANCE BETWEEN TOUCH INPUT LOCATION AND FINGERPRINT POSITION OBJECT
1430
1435
NO
IS DETECTED DISTANCE WITHIN SPECIFIED DISTANCE?
YES
A

FIG.14A

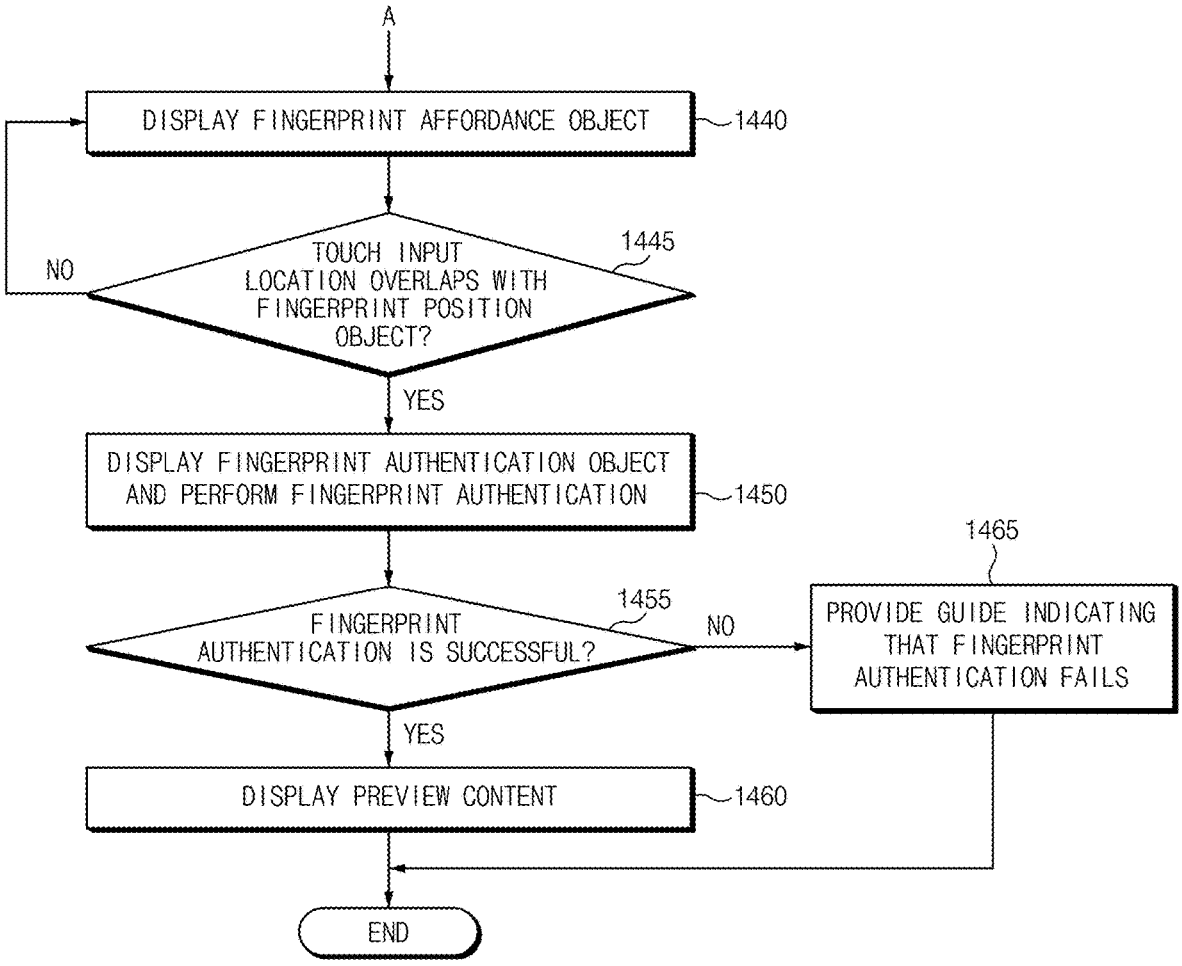

A
DISPLAY FINGERPRINT AFFORDANCE OBJECT
1440
TOUCH INPUT LOCATION OVERLAPS WITH FINGERPRINT POSITION OBJECT?
1445
NO
YES
DISPLAY FINGERPRINT AUTHENTICATION OBJECT AND PERFORM FINGERPRINT AUTHENTICATION
1450
FINGERPRINT AUTHENTICATION IS SUCCESSFUL?
1455
NO
1465
PROVIDE GUIDE INDICATING THAT FINGERPRINT AUTHENTICATION FAILS
YES
DISPLAY PREVIEW CONTENT
1460
END

FIG.14B

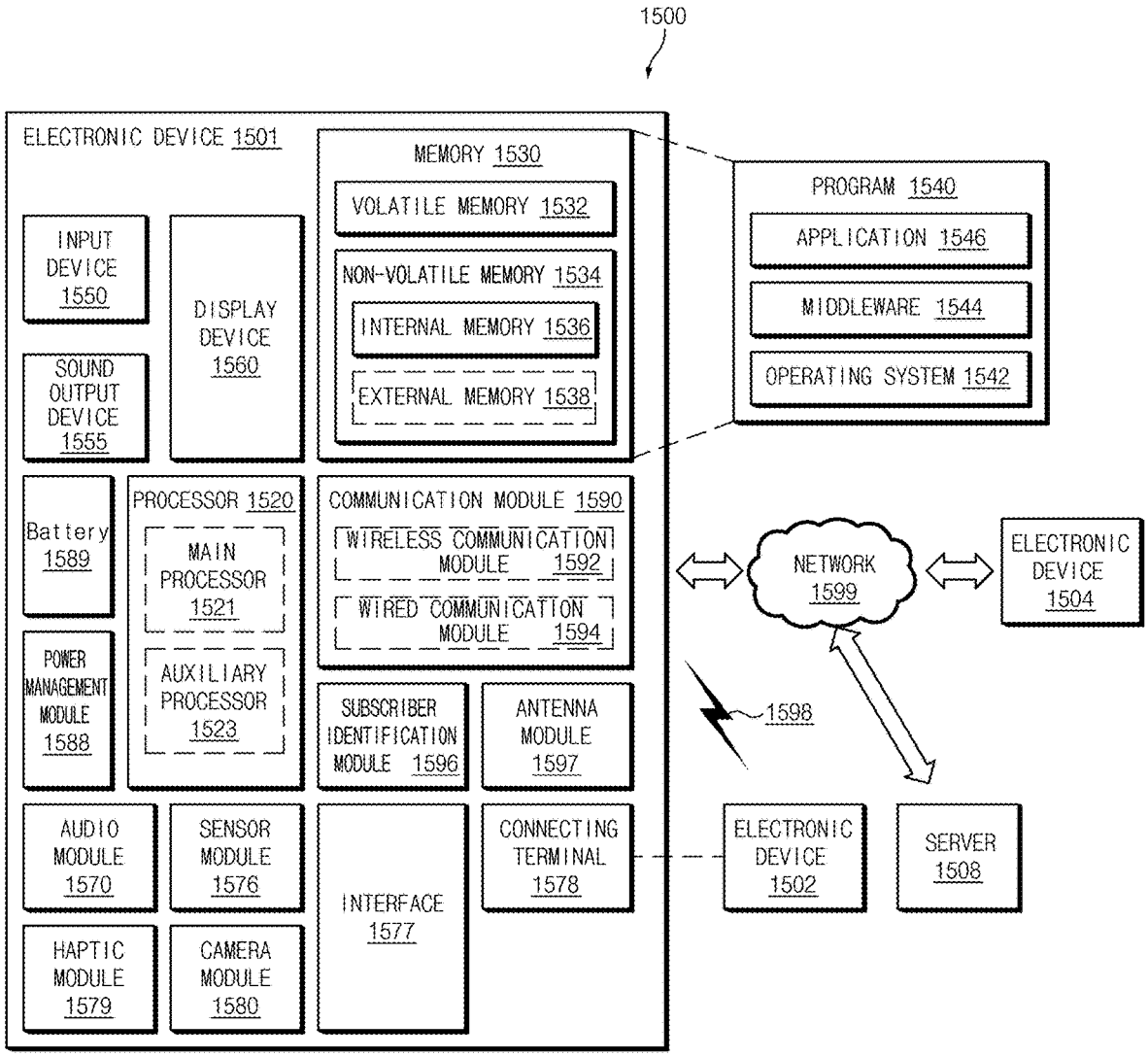

1500
ELECTRONIC DEVICE 1501
INPUT DEVICE 1550
SOUND OUTPUT DEVICE 1555
DISPLAY DEVICE 1560
MEMORY 1530
VOLATILE MEMORY 1532
NON-VOLATILE MEMORY 1534
INTERNAL MEMORY 1536
EXTERNAL MEMORY 1538
PROGRAM 1540
APPLICATION 1546
MIDDLEWARE 1544
OPERATING SYSTEM 1542
Battery 1589
POWER MANAGEMENT MODULE 1588
PROCESSOR 1520
MAIN PROCESSOR 1521
AUXILIARY PROCESSOR 1523
COMMUNICATION MODULE 1590
WIRELESS COMMUNICATION MODULE 1592
WIRED COMMUNICATION MODULE 1594
SUBSCRIBER IDENTIFICATION MODULE 1596
ANTENNA MODULE 1597
AUDIO MODULE 1570
SENSOR MODULE 1576
INTERFACE 1577
CONNECTING TERMINAL 1578
HAPTIC MODULE 1579
CAMERA MODULE 1580
NETWORK 1599
ELECTRONIC DEVICE 1504
1598
ELECTRONIC DEVICE 1502
SERVER 1508

FIG.15

ELECTRONIC DEVICE AND FINGERPRINT AUTHENTICATION INTERFACE METHOD THEREOF

CROSS-REFERENCE TO RELATED APPLICATION

This application is based on and claims priority under 35 U.S.C. § 119 to Korean Patent Application No. 10-2018-0023507, filed on Feb. 27, 2018, in the Korean Intellectual Property Office, the disclosure of which is incorporated by reference herein its entirety.

BACKGROUND

1. Field

The disclosure relates to a message providing function of a security application.

2. Description of Related Art

A conventional electronic device requires unlocking and an app execution procedure, for the purpose of displaying summary information (e.g., a part of a message) of a received message through a notification window and identifying detailed information of the corresponding message. When an app is a security-enabled app, the conventional electronic device may output detailed information of the message by performing security authentication (e.g., fingerprint authentication or password input) while the app is executed.

An electronic device may be equipped with a fingerprint sensor. However, because a fingerprint sensor is disposed on the rear surface of the electronic device in a conventional electronic device equipped with a fingerprint sensor, it may be difficult to perform a one-hand operation in the fingerprint authentication process for identifying the received message.

Because a user may identify the content of the received security message after a procedure of unlocking the electronic device, executing an app associated with the security message, and disabling the security of the app is completed, it may be inconvenient for a user to access a security message.

The above information is presented as background information only to assist with an understanding of the disclosure. No determination has been made, and no assertion is made, as to whether any of the above might be applicable as prior art with regard to the disclosure.

SUMMARY

Embodiments of the disclosure address at least the above-mentioned problems and/or disadvantages and provide at least the advantages described below. Accordingly, an example aspect of the disclosure is to provide an electronic device capable of improving the convenience of the user interface during fingerprint authentication, and a fingerprint authentication interface method thereof.

In accordance with an example aspect of the disclosure, an electronic device may include a housing including a front plate facing a first direction and a rear plate facing a direction opposite the first direction, a touch screen display exposed through a part of the front plate, a fingerprint sensor interposed between the display and the rear plate and disposed to overlap a region of the display when viewed from above the front plate, a processor operatively connected to the display and the fingerprint sensor, and a memory operatively connected to the processor. The memory may store instructions that, when executed, cause the processor to control the electronic device to display a user interface including a first object at a first location of the display, to receive a gesture input to drag the first object from the first location to the region, to move the first object to the region depending on the gesture input, and based on a finger being located on the region, to perform authentication using the fingerprint sensor.

In accordance with another example aspect of the disclosure, a fingerprint authentication interface method may include displaying a notification window including a first object at a first location of a display, receiving a gesture input to drag the first object by a finger of a user from the first location to a fingerprint sensing region through the display, identifying a distance between the finger and the fingerprint sensing region depending on the gesture input, and, when the identified distance is within a specified distance, displaying a second object for inducing fingerprint authentication for the first object, in the fingerprint sensing region.

Other aspects, advantages, and salient features of the disclosure will become apparent to those skilled in the art from the following detailed description, which, taken in conjunction with the annexed drawings, discloses various embodiments of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other aspects, features, and advantages of certain embodiments of the disclosure will be more apparent from the following detailed description, taken in conjunction with the accompanying drawings, in which:

FIG. **1** is a diagram illustrating an exterior appearance of an example electronic device supporting a fingerprint authentication function, according to an embodiment;

FIG. **2** is an exploded perspective view illustrating an example electronic device supporting a fingerprint authentication function, according to an embodiment;

FIG. **3** is a sectional view illustrating an example electronic device, according to an embodiment;

FIG. **4** is a block diagram illustrating an example electronic device, according to an embodiment;

FIG. **5** is a diagram illustrating an example UI screen corresponding to a drag gesture for a message object in a lock screen, according to an embodiment;

FIG. **6** is a diagram illustrating an example UI screen of a fingerprint authentication process, according to an embodiment;

FIGS. **7**A and **7**B are diagrams illustrating example UI screens after a fingerprint authentication process, according to an embodiment;

FIG. **8**A is a diagram illustrating an example UI screen of a process of activating a speech recognition function, according to an embodiment;

FIG. **8**B is a diagram illustrating an example UI screen of a process of executing a speech recognition function, according to an embodiment;

FIG. **9** is a diagram illustrating an example of a plurality of preview content outputting methods, according to an embodiment;

FIGS. **10**A and **10**B are diagrams illustrating an example UI screen of a fingerprint authentication process corresponding to a notification window of an application execution screen, according to an embodiment;

FIG. **11** is a block diagram illustrating an example processor, according to an embodiment;

FIG. **12** is a flowchart illustrating an example fingerprint authentication method, according to an embodiment;

FIG. **13** is a flowchart illustrating an example fingerprint authentication interface method, according to an embodiment;

FIGS. **14**A and **14**B are flowcharts illustrating an example fingerprint authentication interface method, according to an embodiment; and

FIG. **15** is a block diagram illustrating an example electronic device in a network environment according to various embodiments.

DETAILED DESCRIPTION

Hereinafter, various example embodiments of the disclosure will be described with reference to accompanying drawings. However, those of ordinary skill in the art will recognize that various modifications, equivalents, and/or alternatives on various example embodiments described herein can be variously made without departing from the scope and spirit of the disclosure.

FIG. **1** is a diagram illustrating an exterior appearance of an example electronic device supporting a fingerprint authentication function, according to an embodiment.

Referring to FIG. **1**, according to an embodiment, an electronic device **100** according to an embodiment of the disclosure may have a tetragonal shape, and at least part of corners of the electronic device **100** may be rounded. Further, the electronic device **100** may be of an edge type in which at least one side of the electronic device **100** (e.g., a left side or a right side of the electronic device **100** with reference to a longitudinal display state of a display **110**) is gradually curved as it goes towards a periphery of the electronic device **100**. The electronic device **100** may have a form (e.g., a front surface full screen, an edge-to-edge display, or the like) in which the display **110** is expanded to at least one of a lower end or an upper end of a screen.

According to an embodiment, the electronic device **100** may include a fingerprint sensor **120** that senses a fingerprint of a user contacting at least a partial region of the active region on which the screen of the display **110** is displayed. For example, the fingerprint sensor **120** may be disposed in a space (e.g., at the display pixel layer or under the display pixel layer) that is substantially perpendicular (or, facing the thickness direction ('−z' axis)) to at least a partial region of the display **110**. The fingerprint sensor **120** may have a specified size (e.g., a size corresponding to a technical and statistical size, by which the fingerprint of the user is capable of being recognized), and may be disposed on one side or the whole region of a rear surface of the display **110** in the form of, for example, a substrate or sheet. The fingerprint sensor **120** may receive at least part of light (e.g., light reflected by a finger contacting the surface of the display **110**, or the like) of light illuminated from at least one pixel disposed on the display **110** to configure image information necessary for fingerprint recognition and may store the configured image information in the internal memory (not shown) of the fingerprint sensor **120** or in a memory **450** (see, e.g., FIG. **4**) of the electronic device **100** such that the processor (e.g., an application processor (AP), a display driver IC (DDI), a low-power processor, or the like) of the electronic device **100** accesses the image information. According to various embodiments, the fingerprint sensor **120** includes a light emitting unit and a light receiving unit, and may irradiate light by using the light emitting unit under control of the processor, may receive the irradiated light, and may collect the image information necessary for fingerprint authentication.

At least part of the display **110** may be transparent. For example, the display **110** may be provided with a specified transparency (about 2 to 5%) for light in a specific wavelength band (a wavelength band at a periphery of 550 nm). The display **110** may be formed such that a region of the display **110** including at least part of a region in which the fingerprint sensor **120** is disposed is transparent. In this regard, the fingerprint sensor **120** includes a light emitting unit and a light receiving unit, and may irradiate light by using the light emitting unit under control of the processor, may receive the irradiated light, and may collect the image information necessary for fingerprint authentication.

FIG. **2** is an exploded perspective view illustrating an example electronic device supporting a fingerprint authentication function, according to an embodiment.

Referring to FIG. **2**, according to an embodiment, the electronic device **100** (e.g., **100** of FIG. **1**) may include housings **100**A, **100**B, and **100**C, the display **110**, the fingerprint sensor **120**, a pressure sensor **130**, and/or printed circuit boards **210**A and **210**B. In an embodiment, the electronic device may not include some of the above components or may further include any other components. For example, the electronic device **100** may further include an electromagnetic induction panel **220**, a conductive film **240**A, a dielectric substance (e.g., a sheet) **240**B, a conductive feed **240**C, and/or a battery **260**. In an embodiment, some components may be combined to form one entity, which may identically perform functions of some components before the combination.

According to an embodiment, the housings **100**A, **100**B, and **100**C may include the front plate **100**A, the rear plate **100**B, and the metal housing **100**C. The front plate **100**A, the metal housing **100**C, and the rear plate **100**B may be coupled to one another and may form the front surface, the side surface, and the rear surface of the electronic device **100**, respectively. The front surface of the electronic device **100** may be formed by the front plate **100**A, at least part of which is transparent. At least part of the front plate **100**A may expose the display **110**. The rear surface of the electronic device **100** may be formed by the rear plate **100**B which is substantially opaque. The front plate **100**A may face a first direction (z direction) of the electronic device **100**, and the rear plate **100**B may face a second direction (−z direction) opposite to the front surface of the electronic device **100**.

A side surface **100**C_**1** of the electronic device **100** may be formed by the metal housing **100**C. The metal housing **100**C may include the side surface **100**C_**1** and a plane **100**C_**3**. The side surface **100**C_**1** of the metal housing **100**C may form the side surface **100**C_**1** of the electronic device **100**. The side surface **100**C_**1** of the metal housing **100**C may be connected to at least one RF circuit (not illustrated) of the printed circuit boards **210**A and **210**B to operate as an antenna. The side surface **100**C_**1** of the metal housing **100**C may be separated into a plurality of structures by a housing slit **100**C_**2**. The housing slit **100**C_**2** may be formed of a dielectric substance and may separate the structure of the metal housing **100**C. The plane **100**C_**3** of the metal housing **100**C may be located between the front plate **100**A and the rear plate **100**B. The plane **100**C_**3** of the metal housing **100**C may include an upper surface facing the first direction (e.g., z direction) and a lower surface facing the second direction (e.g., −z direction). The display **110** may be mounted on the upper surface of the metal housing **100**C. The conductive film **240**A and the dielectric substance **240**B may be interposed between the display **110** and the upper surface of the plane **100**C_**3**. The pressure sensor **130** or the fingerprint sensor **120** may be further interposed

between the display **110** and the upper surface of the metal housing **100**C. The pressure sensor **130** or the fingerprint sensor **120** may be disposed in a region where the conductive film **240**A and the dielectric substance **240**B are not interposed between the upper surface of the metal housing **100**C and the display **110**. The printed circuit boards **210**A and **210**B, wireless antenna modules **230**A and **230**B, or the battery **260** may be interposed between the rear surface of the metal housing **100**C and the rear plate **100**B. In the case of the wireless antenna modules **230**A and **230**B, the wireless antenna coil **230**B may be formed on the flexible circuit board **230**A. The wireless antenna coil **230**B may be for NFC, MST, or WPC communication.

The surfaces of the housing **100**A, **100**B, and **100**C exposed to the outside may be used as an antenna. One housing structure may form an inverted F-antenna. The inverted F-antenna may be connected to one feeding and one ground. The one housing structure may be electrically connected to at least one of the printed circuit boards **210**A and **210**B through a connection member. One end of the one housing structure may be connected to the feeding or ground. The side surface of the metal housing **100**C may be separated into a plurality of antenna structures by a slit structure.

The display **110** may display a screen according to a screen ratio (e.g., 18.5:9 (default) or 21:9) determined by a processor. For example, the display region of the display **110** may be distinguished into a first region and a second region. A control object (e.g., a soft key) may be displayed in the first region. For example, the control object may include at least one object of a virtual side key or a home key. The second region may be a region for displaying objects corresponding to various applications. The display **110** may be a touch screen display including a touch sensor panel. For example, the touch sensor panel may have a Y-OCTA structure and may be formed on the display **110**.

The touch sensor TSP may sense the touch of the user entered to the display **110**. The touch sensor TSP may be implemented to have a size the same as or similar to the size of the display **110** so as to recognize the touch coordinates corresponding to the display region of the display **110**. The touch sensor TSP may include an RX electrode and a TX electrode, and may sense the touch of the user based on a change in capacitance. For example, the touch panel of the touch sensor TSP may include the RX electrode and the TX electrode in a single layer. The touch coordinates recognized via the touch sensor TSP may be used in conjunction with the pressure coordinates sensed via the pressure sensor **130**.

The pressure sensor **130** may sense the pressure applied to the pressure sensor panel. The pressure sensor **130** may be implemented in a capacitive manner. The pressure sensor **130** may be implemented in a self-capacitance manner and a mutual capacitance. The pressure sensor panel may be implemented with dual layer including an RX electrode layer and a TX electrode layer. A dielectric substance is disposed between the RX electrode layer and the TX electrode layer so as to maintain the gap between the electrode layers. The electrode configuration of the pressure sensor **130** may differ depending on the capacitance type (self-capacitance or mutual capacitance). The pressure sensor **130** may be disposed under the whole region of the display **110** or may be disposed under the partial region of the display **110**. An embodiment is exemplified in FIG. **2** as the pressure sensor **130** is disposed under a partial region of the display **110**. The pressure sensor **130** may replace a home key button.

For example, the fingerprint sensor **120** may be an optical fingerprint sensor or an ultrasonic fingerprint sensor. The fingerprint sensor **120** may be disposed under the display **110**. The fingerprint sensor **120** may receive reflected light during the contact of a user's finger, using the light source of the display **110**, may obtain image information necessary for fingerprint authentication of the finger using the reflected light, and may store the obtained image information in the internal memory or in the memory of the electronic device **100**.

The printed circuit boards **210**A and **210**B may include the main board **210**A and the sub board **210**B. A processor (e.g., AP or CP), a memory, a transmitter and receiver circuit (e.g., a transmitter, a PA, a BPF, a duplexer, or a diplexer), or the like may be disposed on the main board **210**A. An interface circuit (e.g., a USB connector **211**, an audio connector (e.g., earphone connector), a speaker connection, an antenna connection, or the like) may be disposed on the sub board **210**B. A RF signal between the main board **210**A and the sub board **210**B may be transmitted through a coaxial cable. A signal other than the RF signal between the main board **210**A and the sub board **210**B may be transmitted through a connector (board to board connector). At least one of the printed circuit boards **210**A and **210**B may include a connection circuit between components of the RF circuit. At least one of the printed circuit boards **210**A and **210**B may be electrically connected to the antenna of the metal housing **100**C via a connection member. At least one of the printed circuit boards **210**A and **210**B may be electrically connected to the antenna of the metal housing **100**C via a screw and a c-clip. The screw may enhance the electrical characteristics by tightly pressing contacts between the at least one of the printed circuit boards **210**A and **210**B and the metal housing **100**C. The screw may be used to reinforce the ground or the feeding.

The electromagnetic induction panel **220** may be a panel for recognizing a user interface using the stylus pen.

The conductive film **240**A may be electrically connected to the ground of the electromagnetic induction panel **220** or to the ground of the display **110**. As the ground extends, the conductive film **240**A may absorb the noise signal of the electronic device **100** and may form a shield layer. For example, the conductive film **240**A may be formed of a copper sheet. The conductive film **240**A may be electrically separated from the metal housing **100**C by the dielectric substance **240**B interposed between the conductive film **240**A and the metal housing **100**C. The metal housing **100**C and the dielectric substance **240**B may form mutual AC coupling.

The conductive feed **240**C is disposed at the center of the plane slot **100**C_**4** of the metal housing **100**C and may be fixed (attached) thereto. The attachment location of the conductive feed **240**C of the metal housing **100**C may be changed to adjust the resonant coupling frequency. The shape of the conductive feed **240**C may be variously formed depending on a slot shape. The conductive feed **240**C may be formed of a material the same as the conductive film **240**A or may be formed of a material different from the conductive film **240**A. The conductive feed **240**C may separate a single loop of the plane slot **100**C_**4** of the metal housing **100**C into a dual loop.

FIG. **3** is a sectional view illustrating an example electronic device (e.g., the electronic device **100** of FIG. **2**), according to an embodiment.

Referring to FIG. **3**, according to an embodiment, the display region of the display **110** (e.g., **110** of FIG. **1**) may include a fingerprint sensing region **310**. The fingerprint

sensing region **310** may be a region, which overlaps with the fingerprint sensor **120** (e.g., **120** in FIG. **1**), in a region of the display **110** when viewed from above the front plate **100**A (e.g., **100**A of FIG. **2**). The fingerprint sensing region **310** may overlap with a pressure sensing region **320** by the pressure sensor **130**. As such, while the fingerprint sensor **120** obtains image information about the fingerprint of the user's finger, the pressure sensor **130** may sense the intensity of the pressure by the user's finger.

FIG. **4** is a block diagram illustrating an example electronic device (e.g., the electronic device **100** of FIG. **3**), according to an embodiment.

Referring to FIG. **4**, according to an embodiment, an electronic device **400** may include a fingerprint sensor **410** (e.g., the fingerprint sensor **120** of FIG. **3**), a display **440** (e.g., the display **110** of FIG. **3**), the memory **450**, and a processor (e.g., including processing circuitry) **460**. In an embodiment, the electronic device **400** may not include some of the above components or may further include any other components. For example, the electronic device **400** may further include a pressure sensor **420** (e.g., the pressure sensor **130** of FIG. **3**), and/or a speech recognition circuit **430**. In an embodiment, some components may be combined to form one entity, which may identically perform functions of some components before the combination. The relation between the input and the output illustrated in FIG. **4** may illustrated by way of example for descriptive convenience. Accordingly, embodiments of the disclosure may not be limited thereto. In an embodiment, the fingerprint sensor **410**, the pressure sensor **420**, the speech recognition circuit **430**, the display **440**, the memory **450**, and the processor **460** may be interposed between the front plate **100**A and the rear plate **100**B.

According to an embodiment, the fingerprint sensor **410** may be interposed between the display **440** and the rear plate **100**B so as to overlap with the fingerprint sensing region **310** of the display **440** when viewed from above the front plate **100**A. The fingerprint sensor **410** may obtain image information necessary for fingerprint authentication with respect to a user's finger located in the fingerprint sensing region **310**. The fingerprint sensor **410** may store the obtained image information in internal memory or in the memory **450**. For example, the fingerprint sensor **410** may be an optical fingerprint sensor or an ultrasonic fingerprint sensor. When the fingerprint sensor **410** is an optical fingerprint sensor, the fingerprint sensor may sense the fingerprint using the light source of the display **440**. When the fingerprint sensor **410** is an ultrasonic fingerprint sensor, the fingerprint sensor **410** may include an emitting unit outputting ultrasonic waves and a receiving unit receiving ultrasonic waves.

According to an embodiment, the pressure sensor **420** may be interposed between the display **440** and the rear plate **100**B and overlaps with the fingerprint sensing region **310** when viewed from above the front plate **100**A. Under control of the processor **460**, the pressure sensor **420** may sense the pressure intensity and may output pressure information corresponding to the sensed pressure intensity.

According to an embodiment, the speech recognition circuit **430** may include at least one of a microphone and an audio codec, but the disclosure is not limited thereto. Under control of the processor **460**, the speech recognition circuit **430** may detect a voice through a microphone and may output audio data as the result of digitally converting the sensed voice signal through the audio codec.

According to an embodiment, the display **440** may display various content (e.g., a text, an image, a video, an icon, a symbol, and/or the like) to a user. The display **440** may include, for example, and without limitation, a liquid crystal display (LCD), a light-emitting diode (LED) display, an organic LED (OLED) display, an electronic paper display, or the like. The display **440** may be exposed through at least part of the front plate **100**A. The display **440** may be a touch screen display. The display **440** may be implemented independently of a touch sensor. However, an example embodiment may include the display **440** is integrated with the touch sensor.

According to an embodiment, the memory **450** may store, for example, instructions or data associated with at least one other component of the electronic device **400**. The memory **450** may store instructions that, when executed, cause the processor to display a user interface including an object at a first location of the display **440**, to receive a gesture input to drag the object by a finger of a user from the first location to the region, through the display **440**, to perform authentication using the fingerprint sensor when the finger is located on the region, and to move the object to the region depending on the gesture input. The memory **450** may be a volatile memory (e.g., a random access memory (RAM) or the like), a nonvolatile memory (e.g., a read only memory (ROM), a flash memory, or the like), or a combination thereof.

According to an embodiment, the processor **460** may include various processing circuitry and perform data processing and/or an operation associated with a control and/or a communication of at least one other component(s) of the electronic device **400** using instructions stored in the memory **450**. For example, the processor **460** may include, for example, and without limitation, at least one of a central processing unit (CPU), a graphic processing unit (GPU), a microprocessor, an application processor (AP), an application specific integrated circuit (ASIC), a field programmable gate arrays (FPGA), or the like, and may have a plurality of cores.

According to an embodiment, the processor **460** may output a user interface that includes an object at the first location of the display **440** in the locked state of the electronic device **400**. For example, the user interface may be a lock screen. For another example, the user interface may include a notification window, a notification bar, a notification page, or the like. In this disclosure, an embodiment is illustrated as the user interface is the notification window of the lock screen. The notification window may include a plurality of objects. Each of the objects may be a notification associated with an event, which is generated or received by the electronic device **400**. The object may be an object received through an application that requires security or an object received through an application that does not require security. The notification may be associated with a message or an e-mail.

According to an embodiment, the processor **460** may display an object (hereinafter referred to as a 'fingerprint position object') indicating a fingerprint sensing region **310** in the fingerprint sensing region **310** in a state where a notification window including a message object is displayed at the first location of the display **440**. For example, the fingerprint position object may represent the location of the fingerprint sensing region **310** by the fingerprint sensor **410**, and may be in the form of, for example, a fingerprint. The fingerprint position object may always be displayed in the locked state of the electronic device **400**.

According to an embodiment, the processor **460** may receive a gesture input to drag a message object by the finger of the user towards the fingerprint sensing region **310**, via the display **440**; while the gesture input is entered continu-

ously, the processor **460** may move the message object depending on the gesture input. For example, the processor **460** may move the whole notification window including the message object, depending on the gesture input.

According to an embodiment, when receiving a gesture input in which the message object is dragged to the fingerprint sensing region **310**, the processor **460** may identify the distance between the fingerprint sensing region **310** (or a fingerprint position object) and the user's finger sensed while moving the notification window depending on the gesture input.

According to an embodiment, the processor **460** may display an object (hereinafter referred to as a "fingerprint affordance object") for inducing fingerprint authentication in the fingerprint sensing region **310** based on the distance between the finger and the fingerprint sensing region. The fingerprint affordance object may be composed of a virtual layer different from a fingerprint position object and may be displayed such that at least part of the fingerprint affordance object overlaps with the fingerprint position object. For example, the processor **460** may display the fingerprint affordance object, when the distance between the fingerprint sensing region **310** and the finger is within a specified distance. For another example, the processor **460** may display the fingerprint affordance object, when the movement of the finger to drag a message object in the third direction (e.g., −y direction) is not less than a specified distance. The specified distance may be determined experimentally. For example, the fingerprint affordance object may be displayed in a region wider than the fingerprint position object. According to the above-described embodiment, the processor **460** may allow a user to easily grasp the location of the fingerprint sensing region **310** by displaying the fingerprint affordance object in a state where fingerprint authentication is required.

According to an embodiment, for example, the processor **460** may activate the fingerprint sensor **410** at the time of displaying the fingerprint affordance object prior to the fingerprint authentication. For example, the processor **460** may deactivate the fingerprint sensor **410** until the fingerprint affordance object is displayed; the processor **460** may activate the fingerprint sensor **410** when displaying a fingerprint affordance object. According to the above-described embodiment, the processor **460** may reduce power consumption due to the fingerprint sensor **410** by activating the fingerprint sensor **410** only when fingerprint authentication is required.

According to an embodiment, when the finger is located on the fingerprint sensing region **310** depending on the gesture input, the processor **460** may perform security authentication using the fingerprint sensor **410**. For example, the processor **460** may obtain image information necessary for fingerprint authentication, through the fingerprint sensor **410**, may compare the image information with the user's fingerprint image information stored in the memory **450**, and may complete security authentication when the comparison results indicates that the image information is the same as the user's fingerprint image information.

According to an embodiment, when the finger is located on the fingerprint sensing region **310** depending on the gesture input, the processor **460** may display a fingerprint authentication object indicating that fingerprint authentication is in progress. The fingerprint authentication object may include a fingerprint position object or a fingerprint affordance object.

When the fingerprint sensor **410** is affected by ambient brightness, for example, when the fingerprint sensor **410** is an optical fingerprint sensor, the processor **460** may adjust the brightness value of the fingerprint authentication object to a value not less than a specified brightness value. For example, the specified brightness value may be experimentally determined as the brightness value that satisfies a fingerprint recognition rate of the specified rate by at least the fingerprint sensor **410**. When a notification window (e.g., a message object) overlaps with the fingerprint authentication object during fingerprint authentication, the processor **460** may adjust the transparency of a region that overlaps with the fingerprint authentication object in the notification window. For example, the processor **460** may increase the transparency of the overlapped region of the notification window so as not to interfere with fingerprint recognition due to the region overlapping the fingerprint authentication object in the notification window. According to the above-described embodiment, the processor **460** may prevent an object (e.g., a fingerprint position object or an fingerprint affordance object) indicating a location of the fingerprint sensing region or a fingerprint authentication process from interfering with the fingerprint authentication of the fingerprint sensor **410** during the fingerprint authentication process.

According to an embodiment, when the fingerprint authentication is successful, the processor **460** may display content associated with a message object or another object adjacent to the message object. For example, when the fingerprint authentication is successful, the processor **460** may identify the deep link connected to the message object and may display the preview content in a preview window based on information about the identified deep link. For example, the preview content may include at least part of the content of the message included in the message object. For another example, the preview content may include content from reconstructing the content of a message included in the message object. According to the above-described embodiment, the processor **460** may provide the preview content for the message object by unlocking the lock screen in the locked state of the electronic device **400** or by performing a gesture to drag the message object without executing an application corresponding to the message object.

According to an embodiment, the processor **460** may analyze the contextual content included in the message object and may differently generate the preview content depending on the result of analyzing the contextual content. For example, when the message object includes a text associated with a home, the processor **460** may generate the preview content including a home image or the text associated with the home through an application corresponding to the message object. The processor **460** may expand the message object to correspond to the size of the generated preview content and may display the generated preview content in the expanded message object. According to the above-described embodiment, the processor **460** may improve the visibility of the preview content by reconstructing the message object and then providing the reconstructed message object instead of displaying the content of the message object as it is.

According to an embodiment, the processor **460** may provide a speech recognition interface (e.g., activate the speech recognition circuit **430**) based on the pressure intensity sensed through the pressure sensor **420** after fingerprint authentication. For example, in a situation where fingerprint authentication via the fingerprint sensor **410** is performed, when sensing a pressure not less than a specified intensity through the pressure sensor **420**, the processor **460** may activate the speech recognition circuit **430**, may recognize a

speech recognition command through the speech recognition circuit **430** based on speech recognition technology, may execute the speech recognition command through an application corresponding to the message object, and may display the execution result of the speech recognition command in the message object. For another example, when the processor **460** senses a pressure not less than a specified intensity through the pressure sensor **420** while providing a speech recognition interface, the processor **460** may deactivate the speech recognition interface (e.g., deactivation of the speech recognition circuit **430**). According to the above-described embodiment, the processor **460** may support a speech recognition interface for the message object after fingerprint authentication, thereby improving the ease of use (e.g., the convenience of a one-handed operation) for the electronic device **400**.

According to an embodiment, when a specified time elapses after the gesture input is released, the processor **460** may restore the notification window including the message object expanded due to the preview content, to the state before the gesture input is detected. On the other hand, when the specified time elapses after the preview screen is output, the processor **460** may restore the notification window to the state before the gesture input is detected.

According to the above-described embodiment, the processor **460** may output the preview content corresponding to the object through performing fingerprint authentication once in the locked state of the electronic device **400**, without executing an application corresponding to the object included in the notification window.

In the above-described embodiment, the user interface method in which the notification window is displayed on the lock screen is described. However, an embodiment is not limited thereto. For example, the notification window may be displayed on not only the lock screen but also the home screen or application execution screen. Hereinafter, a user interface corresponding to a notification window output from a home screen or an application execution screen will be described.

According to an embodiment, when the primary fingerprint authentication process is completed in a process of unlocking the electronic device **400**, the processor **460** may provide a fingerprint authentication interface only for a message object, which requires secondary fingerprint authentication, from among the message objects included in the notification window output on the application execution screen or the home screen (hereinafter collectively referred to as 'application execution screen'). The processor **460** may provide the notification window of the application execution screen in the form different from the notification window of the lock screen. For example, because the notification window of the application execution screen may include more message objects than the notification window of the lock screen, the processor **460** may provide a scroll function corresponding to the touch gesture (e.g., a flick gesture) for the notification window of the application execution screen.

The processor **460** may detect the touch input for displaying the notification window in a state where the application execution screen is displayed. For example, the touch input for activating the notification window may be a gesture input to pull down a specified region at the upper portion of the display **440**. In a state where the application execution screen is displayed, when detecting a touch input for displaying the notification window, the processor **460** may activate the notification window. The processor **460** may detect a touch gesture (hereinafter referred to as a "flick gesture") for scrolling a message object in a notification window in a state in which the notification window is activated. When detecting a flick gesture for the scroll, the processor **460** may provide a scroll function for the message object in the notification window. For example, the flick gesture may be a gesture that touches the message object in the notification window and then scrolls down quickly.

When a message object requiring fingerprint authentication overlaps with the fingerprint sensing region **310** or the fingerprint position object while the processor **460** scrolls the list of message objects in the notification window in response to a flick gesture, the processor **460** may stop the scroll, may display the fingerprint affordance object (or fingerprint authentication object) at the overlapped location, may activate the fingerprint sensor **410**, and may perform fingerprint authentication via the fingerprint sensor **410**. When the fingerprint authentication is successful, the processor **460** may display the preview content corresponding to the message object requiring fingerprint authentication, through the display **440**.

After a message object **1022** requiring fingerprint authentication is stopped in the fingerprint sensing region **310**, the processor **460** may detect a second flick gesture input **1061** for the notification window. The processor **460** may again execute the scroll function for the notification window depending on the second flick gesture input. The processor **460** may continue to perform a scroll operation on the notification window in response to the flick gesture until another message object **1023** requiring fingerprint authentication reaches the fingerprint input location.

When the topmost (recently received) message object of the notification window reaches the fingerprint input location, the processor **460** may restore the location of the notification window to a location of the notification window before the first flick gesture is detected. According to the above-described embodiment, it is possible to perform a scroll operation for the notification window and a stop operation for the message object requiring fingerprint authentication at the fingerprint input location in response to the flick gesture, thereby improving the convenience of the user's one-hand gesture.

FIG. **5** is a diagram illustrating an example UI screen corresponding to a drag gesture for a message object in a lock screen, according to an embodiment.

Referring to FIG. **5**, in screen **510**, the processor **460** (e.g., **460** of FIG. **4**) may display a notification window **553** including a first object **511** and a second object **512**, at the first location of the display **440** (e.g., **440** of FIG. **4**) in the locked state of the electronic device **400**. The processor **460** may display a fingerprint position object **551** indicating the fingerprint sensing region **310** in the fingerprint sensing region **310**, in a state where a notification window is displayed. For example, the fingerprint position object **551** may be always displayed on the lock screen. As another example, the fingerprint position object **551** may be displayed when an object requiring fingerprint authentication is included in the notification window **553** in the unlocked state of the electronic device **400**.

In screen **520**, when receiving a gesture input to drag the first object **511** by the finger of the user to the fingerprint sensing region **310** through the display **440**, the processor **460** may identify the distance between the finger and the fingerprint sensing region **310**. When the distance between the finger and the fingerprint sensing region **310** is within a specified distance, for example, the processor **460** may display a fingerprint affordance object **552** that induces fingerprint authentication by overlapping with the fingerprint position object **551**, on the fingerprint sensing region

310. When displaying the fingerprint affordance object **552**, the processor **460** may activate the fingerprint sensor **410**.

FIG. **6** is a diagram illustrating an example UI screen of a fingerprint authentication process, according to an embodiment.

Referring to FIG. **6**, according to an embodiment, for the purpose of identifying the content of a message object **651** in a notification window **650**, the user may select the message object **651** in the notification window **650** using a finger in screen **610**, and may perform a gesture to pull down the selected message object **651** toward the fingerprint sensing region **310** in screen **620**; and thus the user may locate the finger on the fingerprint sensing region **310** in screen **630**.

In screen **610**, in a state where the notification window **650** including a plurality of message objects is displayed on the lock screen of the electronic device **400** (e.g., **400** of FIG. **4**), the processor **460** (e.g., **460** of FIG. **4**) may detect that the message object **651** displayed at the first location of the notification window **650** is touched by the user's finger through the display **440** (e.g., **440** of FIG. **4**). The processor **460** may always display the fingerprint position object **551** (e.g., fingerprint position object) indicating the fingerprint sensing region **310**, regardless of a screen mode. The processor **460** may display the fingerprint position object **551** so as not to overlap with the notification window **650** in a state where there is no touch input.

In screen **620**, when the processor **460** identifies a gesture input in which the finger of the user pulls down the message object **651** from the first location to the fingerprint sensing region **310**, the processor **460** may move the message object **651** toward the fingerprint sensing region **310** along a touch input location. For example, the processor **460** may configure the notification window **650** as a separate virtual layer and may move the layer including the notification window **650** along the touch input location.

When identifying the pull-down touch gesture input, the processor **460** generates the fingerprint affordance object **552** (e.g., a fingerprint affordance object) based on the proximity distance between the touch input location and the fingerprint sensing region and may display the generated fingerprint affordance object **552** so as to overlap with the fingerprint position object **551**. The fingerprint affordance object **552** may be displayed in a region wider than the fingerprint position object **551**. The area of the fingerprint affordance object **552** may coincide with the area of the fingerprint sensing region **310**. For example, the fingerprint affordance object **552** may be a fixed image or an animation image. The processor **460** may configure the notification window **650**, the fingerprint position object **551**, and/or the fingerprint affordance object **552** on different virtual layers, may adjust the shape and transparency of the notification window **650**, the fingerprint position object **551** or the fingerprint affordance object **552** when the notification window **650** is moved by the pull-down touch gesture, and may display the notification window **650**, the fingerprint position object **551**, or the fingerprint affordance object **552** so as to overlap with one another.

The processor **460** may activate the fingerprint sensor **410** and the fingerprint authentication function within a specified time range from a point in time when the fingerprint affordance object **552** is displayed. According to the above-described embodiment, the processor **460** may enable a user to be aware of the activation of the fingerprint sensor **410** and fingerprint authentication function by generating the fingerprint affordance object **552** and may induce the movement of the touch input location towards the fingerprint affordance object **552**. In addition, the processor **460** may reduce the current consumption of the fingerprint sensor **410** by activating the fingerprint sensor **410** at a point in time when fingerprint authentication is required.

In screen **630**, when the touch input location is included in the fingerprint sensing region **310**, the processor **460** may perform fingerprint authentication on a finger. When performing fingerprint authentication, the processor **460** may display a fingerprint authentication object **653** indicating that fingerprint authentication is being performed. When the fingerprint authentication is being performed, the processor **460** may not display the fingerprint position object **551**. When the fingerprint sensor **410** is an optical fingerprint sensor, the processor **460** may display the fingerprint authentication object **653** in color series (e.g., white series) suitable for fingerprint authentication. For example, when the fingerprint sensor **410** is an optical fingerprint sensor, the processor **460** may control the brightness value of the fingerprint authentication object **653** to be greater than the brightness value of the fingerprint affordance object. For example, the fingerprint authentication object **653** may be displayed in an area wider than the fingerprint sensing region **310** or the fingerprint position object **551**. The fingerprint authentication object **653** may be displayed as an opacity image to increase the success rate of fingerprint authentication. According to the above-described embodiment, the electronic device **400** may provide a user interface (e.g., a third object) in the form that enables the user to better understand the fingerprint authentication process.

FIGS. **7**A and **7**B are diagrams illustrating example UI screens after a fingerprint authentication process, according to an embodiment.

In screen **710** of FIGS. **7**A and **7**B, the processor **460** (e.g., **460** of FIG. **4**) may perform fingerprint authentication based on a pull-down touch gesture for a message object **711** in a notification window **715**, in the locked state of the electronic device **400** (e.g., **400** of FIG. **4**).

In screen **721** of FIG. **7**A and screen **722** of FIG. **7**B, when the fingerprint authentication is successful, the processor **460** may display the preview content (or application content) of the selected message object **711** in the preview window form through the display **440** (e.g., **440** of FIG. **4**). The processor **460** may display the preview window and the preview content in a variety of ways. For example, as illustrated in screen **721** of FIG. **7**A, the processor **460** may display the preview content in a region in which the message object **711** is expanded. For another example, as illustrated in screen **722** of FIG. **7**B, the processor **460** may display a preview window **722**A at a location different from the location of the message object **711** and may display the preview content within the preview window **722**A. In an embodiment, the processor **460** may expand the display region of the message object **711** and may display the user interface of the fingerprint authentication process within the expanded message object **711**. For example, the processor **460** may display a fingerprint authentication-related object (e.g., fingerprint position object or fingerprint affordance object) within the expanded message object **711**. In this case, the processor **460** may distinguish the display region of the preview content from the display region of the fingerprint authentication-related object such that the preview content and the fingerprint authentication-related object do not overlap with each other in the message object **711**.

In screen **730** of FIGS. **7**A and **7**B, when the specified time elapses after the processor **460** outputs the preview content, the processor **460** may restore the notification window **715** to a location before the pull-down touch gesture

is input. When receiving a user input (e.g., a pull-up gesture) to restore the notification window **715**, the processor **460** may restore the notification window **715** to a location before the pull-down touch gesture is input. For example, the pull-up gesture may include a gesture to scroll the notification window **715** from bottom to top.

According to various embodiments, there may be a variety of methods in each of which the processor **460** provides the preview content linked to the message object **711** through a preview window **722**A. For example, the processor **460** may analyze the contextual content included in the message object through the machine learning engine and may configure the preview content based on the analysis result. The machine learning engine may include a natural language processing engine, a BOT framework, or a rule engine. For example, the processor **460** may analyze the content of at least one of all images, texts, links, or videos included in the received message through the natural language processing (NLP) engine, may determine the action plan based on the contextual content analyzed through the BOT framework and the rule engine, and may configure the preview content according to the action plan determined through the application linked to the received message.

FIG. **8**A is a diagram illustrating an example UI screen of a process of activating a speech recognition function, according to an embodiment.

In screen **810**, the processor **460** (e.g., **460** of FIG. **4**) may perform fingerprint authentication based on a pull-down touch gesture for a message object **811** in a notification window displayed on a lock screen.

In screen **820**, the processor **460** may detect a pressure touch gesture of a specified strength or more after fingerprint authentication.

In screen **830**, the processor **460** may activate the speech recognition function based on a pressure of a specified strength or more after the fingerprint authentication and may display the first speech recognition object (e.g., Bixby Interface) **831** through the display **440**, instead of the fingerprint position object. The processor **460** may continuously activate (voice stand-by) the speech recognition circuit **430** so as to obtain (e.g., record) the user's voice in a state where the first speech recognition object **831** is displayed.

FIG. **8**B is a diagram illustrating an example UI screen of a process of executing a speech recognition function, according to an embodiment.

In screen **840**, the processor **460** may obtain (e.g., record) a voice command through the speech recognition circuit **430** (e.g., **430** of FIG. **4**). While obtaining a voice command, the processor **460** may display a second speech recognition object **841** indicating that a voice command is being obtained. The second speech recognition object **841** may represent a voice recording state or a natural language processing state (e.g., during voice recording, while processing natural language, or the like).

In screen **850**, when the processor **460** obtains a voice command, the processor **460** may convert the obtained voice command into a text command. For example, the processor **460** may analyze the voice command through the NLP engine and may convert the voice command to a text by the natural language generation (NLG) engine. The processor **460** may display the converted text **852** in a voice command window **851** in the message object.

In screen **860**, the processor **460** may perform processing corresponding to the voice command through the application corresponding to the message object **811** and may output the command execution result through a new message object **861**. For example, the processor **460** may process a voice command input through the notification manager or machine learning engine and may display the result of processing the voice command by generating the new message object **861** in the notification window. The new message object **861** may be displayed adjacent to the message object **811** (e.g., immediately above the message object). For another example, the processor **460** may display the result of processing the voice command together with other messages in the message object **811**.

In screen **860**, in a state where the first speech recognition object is displayed, when detecting a pressure of a specified intensity or more, the processor **460** may deactivate the speech recognition function (e.g., deactivate the speech recognition circuit **430**). In this case, the processor **460** may display a fingerprint position object **862** instead of the first speech recognition object.

FIG. **9** is a diagram illustrating a plurality of example preview content outputting methods, according to an embodiment.

In screen **910**, the processor **460** (e.g., **460** of FIG. **4**) may perform fingerprint authentication based on a pull-down touch gesture for a message object in a notification window displayed on a lock screen.

In screen **920**, the processor **460** may identify that a plurality of messages are included in the message object, after the fingerprint authentication is successful. For example, when deep link activity associated with each message is different, the processor **460** (e.g., deep link manager) may make a request for each preview content to the application corresponding to the message object. The processor **460** (e.g., notification manager) may configure each preview content received from the application as a page, and may display the configured page through the message object in the notification window.

In screen **930**, when a specified time elapses after touch is released or when a gesture of the user to restore the notification window to the previous location and size is detected, the processor **460** may not display the preview content anymore and may restore the notification window to the location and size before the pull-down touch gesture is detected.

In the above-described embodiment, a user interface method in which a notification window is displayed on a lock screen is described. However, the notification window may be displayed on not only the lock screen but also the home screen or application execution screen. Hereinafter, the user interface method corresponding to a notification window output from a home screen or an application execution screen will be described.

FIGS. **10**A and **10**B are diagrams illustrating an example UI screen of a fingerprint authentication process corresponding to a notification window of an application execution screen, according to an embodiment. FIG. **10**A illustrates a user interface of a process of authenticating a fingerprint depending on a swipe gesture input in a notification window displayed on a home screen or application execution screen.

Referring to FIG. **10**A, according to an embodiment, the processor **460** (e.g., **460** of FIG. **4**) may also provide preview content through a message object together with fingerprint authentication on the home screen or application execution screen. When the first fingerprint authentication process is completed during the unlocking of the electronic device **400** (e.g., **400** of FIG. **4**), the processor **460** may provide a fingerprint authentication interface only for the message object requiring fingerprint authentication among the message objects included in the notification window output from the home screen or application execution screen. The noti-

fication window of the application execution screen may be provided in a form different from the notification window of the lock screen. Because the notification window of the application execution screen may include more message objects than the notification window of the lock screen, the processor **460** may provide a scroll function corresponding to the touch gesture (e.g., a flick gesture).

In screen **1010**, the processor **460** may detect the touch input for displaying the notification window in a state where the home screen or the application execution screen is displayed. For example, a touch input **1011** for activating the notification window may be a gesture input to pull down a specified region of the upper portion of the display **440**. In a state where the home screen or the application execution screen is displayed, when detecting a touch input for displaying the notification window, the processor **460** may activate the notification window.

In screen **1020**, the processor **460** may detect a touch gesture **1021** for scrolling a message object in a notification window in a state in which the notification window is activated. When detecting the touch gesture **1021** for the scroll, the processor **460** may provide a scroll function for the message object in the notification window.

In screen **1030**, when the message object **1022** requiring fingerprint authentication overlaps with the fingerprint sensing region **310** or a fingerprint position object **1031** while the processor **460** scrolls the list of message objects in the notification window in response to the touch gesture **1021**, the processor **460** may stop the scroll, may display a fingerprint affordance object **1032** at the overlapped location, and may activate a fingerprint authentication interface through the fingerprint sensor **410**.

Referring to FIG. **10**B, in screen **1040**, the processor **460** may perform fingerprint authentication through the fingerprint sensor **410**. The processor **460** may display a fingerprint authentication object **1041** while fingerprint authentication is being performed.

In screen **1050**, when the fingerprint authentication is successful, the processor **460** may display the preview content corresponding to the message object, of which fingerprint authentication is successful, through the display **440**.

In screen **1060**, after the message object **1022** requiring fingerprint authentication is stopped at the fingerprint input location, the processor **460** may detect the second flick gesture input **1061** for another message object **1023** requiring fingerprint authentication. The processor **460** may again execute the scroll function for a notification window **1025** depending on an additional flick gesture input. The processor **460** may continue to perform a scroll operation on the notification window in response to the flick gesture until another message object **1023** reaches the fingerprint input location.

When the topmost (recently received) message object of the notification window **1025** reaches the fingerprint input location, the processor **460** may restore the location of the notification window to a location of the notification window before the first flick gesture is detected. According to the above-described embodiment, it is possible to perform a scroll operation for the notification window and a stop operation for the message object requiring fingerprint authentication at the fingerprint input location in response to the flick gesture, thereby improving the convenience of the user's one-hand gesture.

FIG. **11** is a block diagram illustrating an example processor, according to an embodiment.

Referring to FIG. **11**, according to an embodiment, the processor (e.g., including processing circuitry) **460** (e.g., **460** of FIG. **4**) may include an operating system **1170**, a notification manager (e.g., including processing circuitry and/or executable program elements) **1110**, a gesture listener (e.g., including processing circuitry and/or executable program elements) **1140**, a package manager (e.g., including processing circuitry and/or executable program elements) **1120**, a deep link manager (e.g., including processing circuitry and/or executable program elements) **1150**, a security manager (e.g., including processing circuitry and/or executable program elements) **1130**, and a machine learning engine (e.g., including processing circuitry and/or executable program elements) **1160**. Elements of the processor **460** may be a separate hardware module or may be a software module implemented by at least one processor **460**. For example, the function of each of the modules included in the processor **460** may be performed by one processor **460** or may be performed by each separate processor.

The gesture listener **1140** may include various processing circuitry and/or executable program elements and detect a gesture input for fingerprint authentication for the message object in the notification window. The gesture listener **1140** may display a fingerprint authentication-related object (e.g., fingerprint affordance object or fingerprint authentication object) on the display **440** (e.g., **440** of FIG. **4**) based on the distance between the message object and the fingerprint sensing region **310**. The gesture listener **1140** may detect a pressure gesture for activating the speech recognition interface.

The security manager **1130** may include various processing circuitry and/or executable program elements and perform a fingerprint authentication process for the user's finger. The security manager **1130** may inform the deep link manager **1150** of the success of fingerprint authentication.

The deep link manager **1150** may include various processing circuitry and/or executable program elements and connect to the deep link in conjunction with a message object.

The machine learning engine **1160** may include various processing circuitry and/or executable program elements and analyze the contextual content included in the message corresponding to the message object, may generate an action plan based on the analyzed content, and may make a request for preview content corresponding to the generated action plan to the notification manager **1110**. The machine learning engine **1160** may further configure an action plan corresponding to the speech recognition command obtained through the speech recognition circuit **430** (e.g., **430** of FIG. **4**).

The notification manager **1110** may include various processing circuitry and/or executable program elements and configure the preview content according to the action plan through the application corresponding to the message object, may expand the display region of the message object, and may display the preview content within the expanded object through the display **440**.

FIG. **12** is a flowchart illustrating an example fingerprint authentication method, according to an embodiment.

Referring to FIG. **12**, in operation **1210**, the processor **460** (e.g., **460** of FIG. **4**) may display a user interface including an object at a first location of the display **440** (e.g., **440** of FIG. **4**).

In operation **1220**, the processor **460** may obtain a gesture input to drag the object by a finger of a user from the first location to the region, through the display.

In operation **1230**, the processor **460** may move the object to the region depending on the gesture input.

In operation **1240**, the processor **460** may perform authentication using the fingerprint sensor **410** when the finger is located on the region.

FIG. **13** is a flowchart illustrating an example fingerprint authentication interface method, according to an embodiment.

Referring to FIG. **13**, in operation **1310**, the processor **460** (e.g., **460** of FIG. **4**) may display a notification window including a message object at a first location of the display **440** (e.g., **440** of FIG. **4**).

In operation **1320**, the processor **460** may obtain a gesture input to drag the message object by the user's finger from the first location to the fingerprint sensing region, through the display **440**.

In operation **1330**, the processor **460** may identify the distance between the finger and the fingerprint sensing region depending on the gesture input.

In operation **1340**, the processor **460** may display a fingerprint affordance object to induce fingerprint authentication for the message object, in the overlapped region when the identified distance is within a specified distance.

FIGS. **14**A and **14**B are flowcharts illustrating an example fingerprint authentication interface method, according to an embodiment.

Referring to FIG. **14**A, when the electronic device **400** (e.g., **400** of FIG. **4**) is in a locked state in operation **1405**, the processor **460** may display a lock screen including a fingerprint position object in operation **1410**. When the electronic device **400** is not in the locked state, for example, in a state where a home screen or application execution screen is displayed, the processor **460** may not display the fingerprint position object when fingerprint authentication is not required.

When there is a received message in operation **1415**, in operation **1420**, the processor **460** may display a notification window including an object (hereinafter, referred to as a "message object") corresponding to the received message. The processor **460** may display a lock screen including a fingerprint position object when the received message is not present in operation **1415**.

When obtaining a pull-down gesture input for the message object in the notification window in operation **1425**, in operation **1430**, the processor **460** may detect the distance between the touch input location and the fingerprint position object. When the processor **460** does not obtain the pull-down gesture input in operation **1425**, the processor **460** may display the notification window including a message object.

The processor **460** may determine whether the detected distance is within a specified distance in operation **1435**. Referring to FIG. **14**B, in operation **1440**, the processor **460** may display the fingerprint affordance object when the detected distance is within the specified distance. When the detected distance is not less than the specified distance in operation **1435**, the processor **460** may detect the distance between the touch input location and the fingerprint position object.

In operation **1445**, the processor **460** may determine whether the touch input location overlaps with the fingerprint position object; in operation **1450**, the processor **460** may display the fingerprint authentication object and may perform fingerprint authentication using the fingerprint sensor **410**, when the touch input location overlaps with the fingerprint position object. When the touch input location does not overlap with the fingerprint position object in operation **1445**, the processor **460** may continue to display the fingerprint affordance object.

When the fingerprint authentication is successful in operation **1455**, in operation **1460**, the processor **460** may output the preview content in the message object. When the fingerprint authentication fails in operation **1455**, in operation **1465**, the processor **460** may display the screen information for providing a guide indicating that the fingerprint authentication fails, on the display **440**.

In operation **1405** to operation **1465**, when the specified time elapses without detection of the touch input while the processor **460** displays at least one object through the display **440**, the processor **460** may deactivate the display **440**.

According to various embodiments of the disclosure, it is possible to improve the accessibility to the security app. Additionally, a variety of effects directly or indirectly understood through this disclosure may be provided.

FIG. **15** is a block diagram illustrating an electronic device **1501** in a network environment **1500** according to various embodiments. Referring to FIG. **15**, the electronic device **1501** in the network environment **1500** may communicate with an electronic device **1502** via a first network **1598** (e.g., a short-range wireless communication network), or an electronic device **1504** or a server **1508** via a second network **1599** (e.g., a long-range wireless communication network). According to an embodiment, the electronic device **1501** may communicate with the electronic device **1504** via the server **1508**. According to an embodiment, the electronic device **1501** may include a processor **1520**, memory **1530**, an input device **1550**, a sound output device **1555**, a display device **1560**, an audio module **1570**, a sensor module **1576**, an interface **1577**, a haptic module **1579**, a camera module **1580**, a power management module **1588**, a battery **1589**, a communication module **1590**, a subscriber identification module (SIM) **1596**, or an antenna module **1597**. In some embodiments, at least one (e.g., the display device **1560** or the camera module **1580**) of the components may be omitted from the electronic device **1501**, or one or more other components may be added in the electronic device **1501**. In some embodiments, some of the components may be implemented as single integrated circuitry. For example, the sensor module **1576** (e.g., a fingerprint sensor, an iris sensor, or an illuminance sensor) may be implemented as embedded in the display device **1560** (e.g., a display).

The processor **1520** may execute, for example, software (e.g., a program **1540**) to control at least one other component (e.g., a hardware or software component) of the electronic device **1501** coupled with the processor **1520**, and may perform various data processing or computation. According to one embodiment, as at least part of the data processing or computation, the processor **1520** may load a command or data received from another component (e.g., the sensor module **1576** or the communication module **1590**) in volatile memory **1532**, process the command or the data stored in the volatile memory **1532**, and store resulting data in non-volatile memory **1534**. According to an embodiment, the processor **1520** may include a main processor **1521** (e.g., a central processing unit (CPU) or an application processor (AP)), and an auxiliary processor **1523** (e.g., a graphics processing unit (GPU), an image signal processor (ISP), a sensor hub processor, or a communication processor (CP)) that is operable independently from, or in conjunction with, the main processor **1521**. Additionally or alternatively, the auxiliary processor **1523** may be adapted to consume less power than the main processor **1521**, or to be specific to a

specified function. The auxiliary processor **1523** may be implemented as separate from, or as part of the main processor **1521**.

The auxiliary processor **1523** may control at least some of functions or states related to at least one component (e.g., the display device **1560**, the sensor module **1576**, or the communication module **1590**) among the components of the electronic device **1501**, instead of the main processor **1521** while the main processor **1521** is in an inactive (e.g., sleep) state, or together with the main processor **1521** while the main processor **1521** is in an active state (e.g., executing an application). According to an embodiment, the auxiliary processor **1523** (e.g., an image signal processor or a communication processor) may be implemented as part of another component (e.g., the camera module **1580** or the communication module **1590**) functionally related to the auxiliary processor **1523**.

The memory **1530** may store various data used by at least one component (e.g., the processor **1520** or the sensor module **1576**) of the electronic device **1501**. The various data may include, for example, software (e.g., the program **1540**) and input data or output data for a command related thereto. The memory **1530** may include the volatile memory **1532** or the non-volatile memory **1534**.

The program **1540** may be stored in the memory **1530** as software, and may include, for example, an operating system (OS) **1542**, middleware **1544**, or an application **1546**.

The input device **1550** may receive a command or data to be used by other component (e.g., the processor **1520**) of the electronic device **1501**, from the outside (e.g., a user) of the electronic device **1501**. The input device **1550** may include, for example, a microphone, a mouse, or a keyboard.

The sound output device **1555** may output sound signals to the outside of the electronic device **1501**. The sound output device **1555** may include, for example, a speaker or a receiver. The speaker may be used for general purposes, such as playing multimedia or playing record, and the receiver may be used for an incoming calls. According to an embodiment, the receiver may be implemented as separate from, or as part of the speaker.

The display device **1560** may visually provide information to the outside (e.g., a user) of the electronic device **1501**. The display device **1560** may include, for example, a display, a hologram device, or a projector and control circuitry to control a corresponding one of the display, hologram device, and projector. According to an embodiment, the display device **1560** may include touch circuitry adapted to detect a touch, or sensor circuitry (e.g., a pressure sensor) adapted to measure the intensity of force incurred by the touch.

The audio module **1570** may convert a sound into an electrical signal and vice versa. According to an embodiment, the audio module **1570** may obtain the sound via the input device **1550**, or output the sound via the sound output device **1555** or a headphone of an external electronic device (e.g., an electronic device **1502**) directly (e.g., wiredly) or wirelessly coupled with the electronic device **1501**.

The sensor module **1576** may detect an operational state (e.g., power or temperature) of the electronic device **1501** or an environmental state (e.g., a state of a user) external to the electronic device **1501**, and then generate an electrical signal or data value corresponding to the detected state. According to an embodiment, the sensor module **1576** may include, for example, a gesture sensor, a gyro sensor, an atmospheric pressure sensor, a magnetic sensor, an acceleration sensor, a grip sensor, a proximity sensor, a color sensor, an infrared (IR) sensor, a biometric sensor, a temperature sensor, a humidity sensor, or an illuminance sensor.

The interface **1577** may support one or more specified protocols to be used for the electronic device **1501** to be coupled with the external electronic device (e.g., the electronic device **1502**) directly (e.g., wiredly) or wirelessly. According to an embodiment, the interface **1577** may include, for example, a high definition multimedia interface (HDMI), a universal serial bus (USB) interface, a secure digital (SD) card interface, or an audio interface.

A connecting terminal **1578** may include a connector via which the electronic device **1501** may be physically connected with the external electronic device (e.g., the electronic device **1502**). According to an embodiment, the connecting terminal **1578** may include, for example, a HDMI connector, a USB connector, a SD card connector, or an audio connector (e.g., a headphone connector),

The haptic module **1579** may convert an electrical signal into a mechanical stimulus (e.g., a vibration or a movement) or electrical stimulus which may be recognized by a user via his tactile sensation or kinesthetic sensation. According to an embodiment, the haptic module **1579** may include, for example, a motor, a piezoelectric element, or an electric stimulator.

The camera module **1580** may capture a still image or moving images. According to an embodiment, the camera module **1580** may include one or more lenses, image sensors, image signal processors, or flashes.

The power management module **1588** may manage power supplied to the electronic device **1501**. According to one embodiment, the power management module **1588** may be implemented as at least part of, for example, a power management integrated circuit (PMIC).

The battery **1589** may supply power to at least one component of the electronic device **1501**. According to an embodiment, the battery **1589** may include, for example, a primary cell which is not rechargeable, a secondary cell which is rechargeable, or a fuel cell.

The communication module **1590** may support establishing a direct (e.g., wired) communication channel or a wireless communication channel between the electronic device **1501** and the external electronic device (e.g., the electronic device **1502**, the electronic device **1504**, or the server **1508**) and performing communication via the established communication channel. The communication module **1590** may include one or more communication processors that are operable independently from the processor **1520** (e.g., the application processor (AP)) and supports a direct (e.g., wired) communication or a wireless communication. According to an embodiment, the communication module **1590** may include a wireless communication module **1592** (e.g., a cellular communication module, a short-range wireless communication module, or a global navigation satellite system (GNSS) communication module) or a wired communication module **1594** (e.g., a local area network (LAN) communication module or a power line communication (PLC) module). A corresponding one of these communication modules may communicate with the external electronic device via the first network **1598** (e.g., a short-range communication network, such as Bluetooth™, wireless-fidelity (Wi-Fi) direct, or infrared data association (IrDA)) or the second network **1599** (e.g., a long-range communication network, such as a cellular network, the Internet, or a computer network (e.g., LAN or wide area network (WAN)). These various types of communication modules may be implemented as a single component (e.g., a single chip), or may be implemented as multi components (e.g., multi chips)

separate from each other. The wireless communication module **1592** may identify and authenticate the electronic device **1501** in a communication network, such as the first network **1598** or the second network **1599**, using subscriber information (e.g., international mobile subscriber identity (IMSI)) stored in the subscriber identification module **1596**.

The antenna module **1597** may transmit or receive a signal or power to or from the outside (e.g., the external electronic device) of the electronic device **1501**. According to an embodiment, the antenna module **1597** may include one or more antennas, and, therefrom, at least one antenna appropriate for a communication scheme used in the communication network, such as the first network **1598** or the second network **1599**, may be selected, for example, by the communication module **1590** (e.g., the wireless communication module **1592**). The signal or the power may then be transmitted or received between the communication module **1590** and the external electronic device via the selected at least one antenna.

At least some of the above-described components may be coupled mutually and communicate signals (e.g., commands or data) therebetween via an inter-peripheral communication scheme (e.g., a bus, general purpose input and output (GPIO), serial peripheral interface (SPI), or mobile industry processor interface (MIPI)).

According to an embodiment, commands or data may be transmitted or received between the electronic device **1501** and the external electronic device **1504** via the server **1508** coupled with the second network **1599**. Each of the electronic devices **1502** and **1504** may be a device of a same type as, or a different type, from the electronic device **1501**. According to an embodiment, all or some of operations to be executed at the electronic device **1501** may be executed at one or more of the external electronic devices **1502**, **1504**, or **1508**. For example, if the electronic device **1501** should perform a function or a service automatically, or in response to a request from a user or another device, the electronic device **1501**, instead of, or in addition to, executing the function or the service, may request the one or more external electronic devices to perform at least part of the function or the service. The one or more external electronic devices receiving the request may perform the at least part of the function or the service requested, or an additional function or an additional service related to the request, and transfer an outcome of the performing to the electronic device **1501**. The electronic device **1501** may provide the outcome, with or without further processing of the outcome, as at least part of a reply to the request. To that end, a cloud computing, distributed computing, or client-server computing technology may be used, for example.

The electronic device according to various embodiments may be one of various types of electronic devices. The electronic devices may include, for example, a portable communication device (e.g., a smart phone), a computer device, a portable multimedia device, a portable medical device, a camera, a wearable device, or a home appliance. According to an embodiment of the disclosure, the electronic devices are not limited to those described above.

It should be appreciated that various embodiments of the present disclosure and the terms used therein are not intended to limit the technological features set forth herein to particular embodiments and include various changes, equivalents, or replacements for a corresponding embodiment. With regard to the description of the drawings, similar reference numerals may be used to refer to similar or related elements. It is to be understood that a singular form of a noun corresponding to an item may include one or more of the things, unless the relevant context clearly indicates otherwise. As used herein, each of such phrases as "A or B," "at least one of A and B," "at least one of A or B," "A, B, or C," "at least one of A, B, and C," and "at least one of A, B, or C," may include all possible combinations of the items enumerated together in a corresponding one of the phrases. As used herein, such terms as "1st" and "2nd," or "first" and "second" may be used to simply distinguish a corresponding component from another, and does not limit the components in other aspect (e.g., importance or order). It is to be understood that if an element (e.g., a first element) is referred to, with or without the term "operatively" or "communicatively", as "coupled with," "coupled to," "connected with," or "connected to" another element (e.g., a second element), it means that the element may be coupled with the other element directly (e.g., wiredly), wirelessly, or via a third element.

As used herein, the term "module" may include a unit implemented in hardware, software, or firmware, and may interchangeably be used with other terms, for example, "logic," "logic block," "part," or "circuitry". A module may be a single integral component, or a minimum unit or part thereof, adapted to perform one or more functions. For example, according to an embodiment, the module may be implemented in a form of an application-specific integrated circuit (ASIC).

Various embodiments as set forth herein may be implemented as software (e.g., the program **1540**) including one or more instructions that are stored in a storage medium (e.g., internal memory **1536** or external memory **1538**) that is readable by a machine (e.g., the electronic device **1501**). For example, a processor (e.g., the processor **1520**) of the machine (e.g., the electronic device **1501**) may invoke at least one of the one or more instructions stored in the storage medium, and execute it, with or without using one or more other components under the control of the processor. This allows the machine to be operated to perform at least one function according to the at least one instruction invoked. The one or more instructions may include a code generated by a complier or a code executable by an interpreter. The machine-readable storage medium may be provided in the form of a non-transitory storage medium. Wherein, the term "non-transitory" simply means that the storage medium is a tangible device, and does not include a signal (e.g., an electromagnetic wave), but this term does not differentiate between where data is semi-permanently stored in the storage medium and where the data is temporarily stored in the storage medium.

According to an embodiment, an electronic device (e.g., **400** of FIG. **4**) includes a housing including a front plate (e.g., **100**A of FIG. **2**) and a rear plate facing a direction opposite to the front plate (e.g., **100**B of FIG. **2**); a touch screen display (e.g., **440** of FIG. **4**) exposed through a part of the front plate; a fingerprint sensor (e.g., **410** of FIG. **4**) interposed between the display and the rear plate and disposed to overlap with a region of the display when viewed from above the front plate; a processor (e.g., **460** of FIG. **4**) operatively connected to the display and the fingerprint sensor; and a memory (e.g., **450** of FIG. **4**) operatively connected to the processor, wherein the memory stores instructions that, when executed, cause the processor to display a user interface including a first object at a first location of the display; obtain a gesture input to drag the first object by a finger of a user from the first location to the region, through the display; move the first object to the

region depending on the gesture input; and when the finger is located on the region, perform authentication using the fingerprint sensor.

Wherein the instructions further cause the processor to when the authentication is successful, display at least one content associated with the first object or at least another object adjacent to the first object.

Wherein the instructions further cause the processor to when the authentication is successful, expand the first object; and display preview content corresponding to the first object in the expanded first object.

Wherein the first object is a notification associated with an event, which is generated or received by the electronic device.

Wherein the user interface is a lock screen.

Wherein the first object includes a notification bar or a page.

Wherein the notification is associated with a message or an e-mail, and wherein the content includes a text of the message or the e-mail.

Wherein the instructions further cause the processor to when a specific time elapses after the gesture input is released, move the first object to the first location again.

Wherein the fingerprint sensor includes an ultrasonic fingerprint sensor or an optical fingerprint sensor.

According to an embodiment, an electronic device (e.g., **400** of FIG. **4**) includes a housing including a front plate (e.g., **100**A of FIG. **2**) and a rear plate (e.g., **100**B of FIG. **2**) facing a direction opposite to the front plate; a touch screen display (e.g., **440** of FIG. **4**) exposed through a part of the front plate; a fingerprint sensor (e.g., **410** of FIG. **4**) interposed between the display and the rear plate and overlapping with a fingerprint sensing region of the display when viewed from above the front plate; a processor (e.g., **460** of FIG. **4**) operatively connected to the display and the fingerprint sensor; and a memory (e.g., **450** of FIG. **4**) operatively connected to the processor, wherein the memory stores instructions that, when executed, cause the processor to display a notification window including a first object at a first location of the display; obtain a gesture input to drag the first object by a finger of a user from the first location to the fingerprint sensing region, through the display; identify a distance between the finger and the fingerprint sensing region depending on the gesture input; and when the identified distance is within a specified distance, display a second object for inducing fingerprint authentication for the first object, in the fingerprint sensing region.

Wherein the notification window is a notification window displayed on a lock screen of the electronic device.

Wherein the instructions further cause the processor to when the identified distance is within the specified distance, display the second object and activate the fingerprint sensor.

Wherein the instructions further cause the processor to when the finger is positioned in the fingerprint sensing region, perform fingerprint authentication; and display a third object indicating that the fingerprint authentication is in progress.

Wherein the third object is displayed in an area wider than the second object.

Wherein the instructions further cause the processor to display a brightness value of the third object to be a specified brightness value or more.

Wherein the instructions further cause the processor to when the authentication is successful, expand the first object; and display preview content corresponding to the first object in the expanded first object.

Wherein the instructions further cause the processor to analyze contextual content of the first object; and generate the preview content corresponding to the analyzed contextual content, through an application corresponding to the first object.

The electronic device further includes a speech recognition circuit (e.g., **430** of FIG. **4**) interposed between the display and the rear plate; and a pressure sensor (e.g., **420** of FIG. **4**) interposed between the display and the rear plate and overlapping with the fingerprint sensing region when viewed from above the front plate, wherein the instructions further cause the processor to in a situation where the preview content is displayed, when detecting a pressure of specified intensity or more through the pressure sensor, activate the speech recognition circuit; recognize a speech recognition instruction through the speech recognition circuit based on a speech recognition technology; execute the speech recognition instruction through an application corresponding to the first object; and display an execution result of the speech recognition instruction in the first object.

According to an embodiment, a fingerprint authentication interface method, the method includes displaying a notification window including a first object at a first location of a display; receiving a gesture input to drag the first object by a finger of a user from the first location to a fingerprint sensing region, through the display; identifying a distance between the finger and the fingerprint sensing region depending on the gesture input; and when the identified distance is within a specified distance, displaying a second object for inducing fingerprint authentication for the first object, in the fingerprint sensing region.

The method further includes when the identified distance is within the specified distance, displaying the second object and activating the fingerprint sensor.

According to an embodiment, a method according to various embodiments of the disclosure may be included and provided in a computer program product. The computer program product may be traded as a product between a seller and a buyer. The computer program product may be distributed in the form of a machine-readable storage medium (e.g., compact disc read only memory (CD-ROM)), or be distributed (e.g., downloaded or uploaded) online via an application store (e.g., Play Store™), or between two user devices (e.g., smart phones) directly. If distributed online, at least part of the computer program product may be temporarily generated or at least temporarily stored in the machine-readable storage medium, such as memory of the manufacturer's server, a server of the application store, or a relay server.

According to various embodiments, each component (e.g., a module or a program) of the above-described components may include a single entity or multiple entities. According to various embodiments, one or more of the above-described components may be omitted, or one or more other components may be added. Alternatively or additionally, a plurality of components (e.g., modules or programs) may be integrated into a single component. In such a case, according to various embodiments, the integrated component may still perform one or more functions of each of the plurality of components in the same or similar manner as they are performed by a corresponding one of the plurality of components before the integration. According to various embodiments, operations performed by the module, the program, or another component may be carried out sequentially, in parallel, repeatedly, or heuristically, or one

or more of the operations may be executed in a different order or omitted, or one or more other operations may be added.

While the disclosure has been illustrated and described with reference to various example embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the disclosure as defined, for example, by the appended claims and their equivalents.

What is claimed is:

1. An electronic device comprising:

a housing including a front plate facing a first direction and a rear plate facing a direction opposite the first direction;

a touch screen display viewable through a part of the front plate;

a fingerprint sensor interposed between the display and the rear plate and overlapping a fingerprint sensing region of the display when viewed from above the front plate;

a processor operatively connected to the display and the fingerprint sensor; and

a memory operatively connected to the processor,

wherein the memory stores instructions that, when executed by the processor, control the electronic device to:

display a notification window including a first object at a first location of the display, wherein the first object is a first notification object located in the notification window which is displayed on a lock screen of the electronic device;

obtain a gesture input to drag the first notification object from the first location to the fingerprint sensing region;

identify a distance between a finger and the fingerprint sensing region based on the gesture input;

display a second object for inducing fingerprint authentication for the first object in the fingerprint sensing region based on the identified distance being within a specified distance;

perform fingerprint authentication based on a finger being positioned in the fingerprint sensing region, and display a third object indicating that the fingerprint authentication is in progress, wherein the third object is displayed in an area wider than the second object; and

display preview content of the first notification object on the lock screen when authentication performed on the fingerprint sensing region is successful.

2. The electronic device of claim **1**, wherein the instructions, when executed by the processor, further control the electronic device to:

display the second object and activate the fingerprint sensor based on the identified distance being within the specified distance.

3. The electronic device of claim **1**, wherein the instructions, when executed by the processor, further control the electronic device to:

display a brightness value of the third object to be a specified brightness value or more.

4. The electronic device of claim **1**, wherein the instructions, when executed by the processor, further control the electronic device to:

expand the first object based on the authentication being successful; and

display the preview content in the expanded first object.

5. The electronic device of claim **4**, wherein the instructions, when executed by the processor, further control the electronic device to:

analyze contextual content of the first object; and

generate the preview content corresponding to the analyzed contextual content through an application corresponding to the first object.

6. The electronic device of claim **4**, further comprising:

a speech recognition circuit interposed between the display and the rear plate; and

a pressure sensor interposed between the display and the rear plate and overlapping the fingerprint sensing region when viewed from above the front plate,

wherein the instructions, when executed by the processor, further control the electronic device to:

based on the preview content being displayed, activate the speech recognition circuit based on detecting a pressure of specified intensity or more through the pressure sensor;

recognize a speech recognition instruction through the speech recognition circuit based on a speech recognition technology;

execute the speech recognition instruction through an application corresponding to the first object; and

display an execution result of the speech recognition instruction in the first object.

7. A fingerprint authentication interface method, the method comprising:

displaying a notification window on a lock screen of the electronic device, wherein the notification window includes a first object at a first location of a display;

receiving a gesture input to drag the first object from the first location to a fingerprint sensing region;

identifying a distance between a finger and the fingerprint sensing region depending on the gesture input;

displaying a second object for inducing fingerprint authentication for the first object in the fingerprint sensing region based on the identified distance being within a specified distance;

performing fingerprint authentication based on a finger being positioned in the fingerprint sensing region, and displaying a third object indicating that the fingerprint authentication is in progress, wherein the third object is displayed in an area wider than the second object; and

displaying preview content of the first notification object on the lock screen when an authentication performed on the fingerprint sensing region is successful.

8. The method of claim **7**, further comprising: displaying the second object and activating the fingerprint sensor based on the identified distance being within the specified distance.

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